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Talent Training Strategies and Models for Mechanical Engineering Majors in the Age of Intelligent Manufacturing

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Abstract: With the rise of Industry 4.0 and the deep implementation of the "Made in China 2025" strategy, intelligent manufacturing has become a key driving force for the transformation and upgrading of the manufacturing industry. Against this backdrop, the innovation of talent training strategies and models in mechanical engineering has become a focus of attention in the educational sector. This paper first clarifies the connotation, characteristics, and development trends of intelligent manufacturing. It then provides a detailed analysis of the current state of talent training in mechanical engineering, identifying the main issues present. Addressing these issues, the paper proposes talent training programs that meet the demands of intelligent manufacturing. From the perspective of training strategy and model innovation, it thoroughly discusses multidisciplinary crossover training models, school-enterprise cooperation mechanisms, international vision training models, and innovative entrepreneurship education models. Finally, the paper presents specific implementation paths and safeguard measures, aiming to provide references for universities and related educational institutions to better adapt to the talent development needs under the context of intelligent manufacturing.

1. Introduction

Intelligent manufacturing has become the core trend in the development of today's manufacturing industry, with the key being the use of next-generation information technologies to enhance production efficiency and product quality. The "Made in China 2025" plan emphasizes the importance of accelerating the process of intelligent manufacturing, positioning it as a national strategic focus. This reflects a profound transformation marked by digitization, networking, and intelligence that the manufacturing industry is undergoing globally [1, 2]. As one of the world's largest manufacturing countries, China is actively embracing this transformation, viewing intelligent manufacturing as a key path to building a strong manufacturing nation. Against this backdrop, mechanical engineering education faces demands for innovation. Traditional models struggle to meet the new requirements of intelligent manufacturing for talent. Not only is a solid foundation in mechanical engineering necessary, but there is also an urgent need to integrate interdisciplinary capabilities such as information technology, data analysis, and artificial intelligence [3-5]. Therefore, developing innovative educational strategies and training models to cultivate compound talents adapted to the era of intelligent manufacturing is particularly urgent and practically significant.

This paper aims to explore the talent training strategies and models for mechanical engineering under the background of intelligent manufacturing to meet the new era's demand for high-quality, compound talents. The specific objectives include: (i) analyzing the new requirements of intelligent manufacturing for mechanical engineering professionals, clarifying the goals and specifications of talent training; (ii) exploring the feasibility and effectiveness of new training models such as multidisciplinary integration, school-enterprise cooperation, and international perspectives; (iii) proposing specific implementation paths and safeguard measures to promote the development needs of new talents in mechanical engineering. The significance of this research lies in providing theoretical basis and practical guidance for the reform of mechanical engineering education in universities, enhancing graduates' employment competitiveness and innovation ability, meeting the talent needs of the intelligent manufacturing industry, and thereby promoting China's transition from a major manufacturing country to a strong manufacturing nation.

The logical relationship between the main contents in this paper is arranged as shown in Figure 1. First, the connotation, technical characteristics, and future development trends of intelligent manufacturing are clarified, providing direction for the training of mechanical engineering professionals. Next, the current status and existing problems of talent training in mechanical engineering are reviewed, and new requirements under the background of intelligent manufacturing are assessed. Then, combining concepts such as multidisciplinary integration, school-enterprise cooperation, international perspectives, and innovation and entrepreneurship education, a new talent training model is proposed to meet the talent needs under the context of intelligent manufacturing. Finally, implementation paths and safeguard measures for improving the training of mechanical engineering professionals are proposed, offering decision-making references for educational administrative departments and universities.

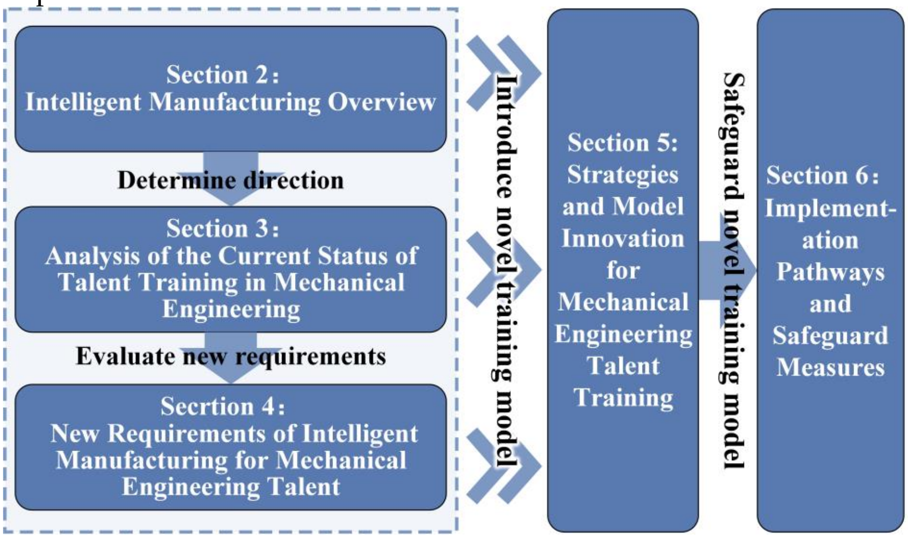

Figure 1: Logical relationship between the main contents in this paper.

2. Intelligent Manufacturing Overview

2.1. Connotation and Main Technical Characteristics of Intelligent Manufacturing

Intelligent manufacturing refers to the use of advanced information technology, industrial technology, and management techniques to automate, digitize, network, and intelligentize the manufacturing process. Its core lies in interconnecting intelligent devices and systems to optimize production processes, enhance efficiency, reduce costs, and improve product quality. Through technologies such as big data, cloud computing, the Internet of Things (IoT), and artificial intelligence (AI), it achieves self-perception, self-decision-making, self-execution, and self-optimization in the production process, which are crucial aspects of intelligent manufacturing [6-8].

The technical characteristics of intelligent manufacturing are mainly reflected in the following aspects:

(1) Digitization: By using sensors, CNC machines, robots, and other equipment, digital descriptions and information collection of various stages in the manufacturing process are realized.

(2) Networking: Utilizing internet and IoT technologies, interconnection and data sharing between devices are achieved, breaking down information silos and enhancing production collaboration efficiency.

(3) Intelligentization: Through technologies such as big data, cloud computing, and AI, the production process can self-perceive, make decisions, and optimize itself, thereby improving production efficiency and product quality.

(4) Flexibility: Intelligent manufacturing systems possess high flexibility and scalability, allowing rapid adjustment of production plans and processes based on market demands.

(5) Service orientation: The shift from merely manufacturing products to providing comprehensive solutions and services extends the industrial chain and adds value.

2.2. Development Trend of Intelligent Manufacturing

The development of intelligent manufacturing is rapidly advancing and presents the following major trends:

(1) Technology Integration and Collaboration: Future intelligent manufacturing will further promote the deep integration and collaborative application of various advanced technologies, including the IoT, big data, cloud computing, AI, blockchain, and more. Through the convergence of multiple technologies, a more intelligent and efficient manufacturing process can be realized.

(2) Digitization and Networking: With the development of digital twin technology, the boundaries between the virtual world and the physical world will become increasingly blurred. Manufacturing systems will achieve networking and remote management of equipment, production lines, and even entire factories through the industrial internet, enhancing the transparency and collaborative efficiency of the manufacturing process.

(3) Personalized Customization: As market demands become increasingly diverse and personalized, intelligent manufacturing is being driven towards large-scale personalized customization. Flexible production systems and intelligent design tools enable the personalization of products and rapid response to market changes.

(4) Green Manufacturing: Environmental protection and sustainable development have become important goals of intelligent manufacturing. By optimizing resource utilization, reducing waste emissions, and improving energy efficiency, green manufacturing and a circular economy can be achieved.

(5) Human-Machine Collaboration: In future intelligent manufacturing systems, humans and machines will collaborate more closely. Intelligent robots and autonomous systems will take on more physical labor and hazardous tasks, while humans will focus on more creative and strategic roles.

In summary, intelligent manufacturing, as the future direction of modern manufacturing, is characterized by its high standards and diversity in talent requirements. Therefore, developing talent cultivation strategies and models oriented towards intelligent manufacturing is of great significance for promoting the transformation and upgrading of the manufacturing industry.

3. Analysis of the Current Status of Talent Training in Mechanical Engineering

3.1. Overview of Current Training Model

The current training model for mechanical engineering majors is primarily based on traditional classroom teaching, with course offerings including foundational theory courses, basic professional courses, and some practical teaching components. Although some universities have begun to explore the introduction of information technology teaching methods and engineering training platforms, the overall approach still mainly involves teachers lecturing and students passively receiving knowledge. This training model can meet basic teaching requirements to a certain extent but has significant shortcomings in developing students' abilities to solve real-world engineering problems and innovate.

3.2. Main Problems in Current Training Model

3.2.1. Unreasonable Course Structure

The existing curriculum is relatively traditional, focusing on the imparting of theoretical knowledge while neglecting the cultivation of practical skills. Some course content is outdated and fails to reflect the latest industry development trends and technological advancements. Additionally, there are few interdisciplinary courses, which cannot meet the demand for composite talents required by intelligent manufacturing. For example, courses related to information technology, data analysis, and artificial intelligence are generally insufficiently offered, leaving students lacking comprehensive abilities to handle complex engineering problems.

3.2.2. Weak Practical Teaching Components

Although experimental teaching and internship practice are included in the training plan, there are issues with formalization and superficiality in actual implementation. Many universities have outdated experimental equipment, and the content of experiments is disconnected from actual production. Internship opportunities also suffer due to time constraints and low participation from enterprises, making it difficult for students to gain substantial hands-on experience. The lack of deep cooperation with enterprises means that students have limited experience in solving real-world engineering problems and cannot effectively apply theoretical knowledge.

3.2.3. Insufficient Faculty Members

The construction of a high-level faculty team lags behind, especially in emerging technical fields such as artificial intelligence and big data analytics, where there is a shortage of teachers capable of handling related teaching tasks. Some teachers lack practical experience themselves, making it difficult to simplify and explain complex engineering problems, which affects the teaching effectiveness. Moreover, due to limitations in the university title evaluation and assessment systems, teachers' energy devoted to teaching innovation and research investment is constrained, further affecting teaching quality and student training outcomes.

3.2.4. Single-dimensional Evaluation System

The current evaluation system overly emphasizes theoretical exam scores, neglecting the assessment of students’ practical abilities and innovative spirit. Students’ grades are mainly determined by final exams, while their performance in practical activities and project results are not fully considered. This singular evaluation method not only limits students' holistic development but also hinders the cultivation of their innovative consciousness and ability to solve practical problems.

3.2.5. Disconnect from Corporate Needs

There is a significant gap between the current training model and the actual needs of enterprises. School education focuses on the systematic and comprehensive nature of theoretical knowledge, overlooking the industry's requirements for practical skills and overall qualities. Enterprises value graduates' practical abilities, teamwork spirit, and innovative thinking more, all of which are challenging to cultivate through traditional teaching models. Furthermore, the lack of effective communication and cooperation mechanisms between schools and enterprises exacerbates the mismatch between talent cultivation and employment needs.

4. New Requirements of Intelligent Manufacturing for Mechanical Engineering Talent

Against the backdrop of intelligent manufacturing, three requirements have been proposed for the training of mechanical engineering professionals: knowledge structure, capability structure, and quality structure. The following elaborates on these three aspects in detail.

4.1. Knowledge Structure Requirements

4.1.1. Basic Knowledge Requirements

Intelligent manufacturing demands that mechanical engineering professionals must possess a solid foundational knowledge base. Firstly, this includes mathematical and natural science fundamentals such as advanced mathematics, linear algebra, probability and statistics, and university physics. These foundational courses not only provide theoretical support for specialized technical learning but also form the basis for cultivating students' logical thinking and problem-solving abilities. Secondly, there are basic engineering courses like mechanics of materials, principles of machinery, and mechanical design, which offer students an understanding and mastery of the basic theories and methods of mechanical manufacturing and automation. Lastly, a foundation in computer science and information technology is essential, including courses in computer programming, data structures, and database management, laying a solid foundation for students to grasp information technology in intelligent manufacturing.

4.1.2. Specialized Knowledge Requirements

In terms of professional knowledge, mechanical engineering professionals need to master modern mechanical design and manufacturing technologies. This includes CNC technology, robotics, precision measurement technology, etc. Additionally, they should be familiar with the design principles and application methods of intelligent equipment. Exposure to emerging fields such as additive manufacturing and the application of artificial intelligence in manufacturing is also necessary. This professional knowledge not only meets the current demand of manufacturing enterprises for technical talents but also provides broad prospects for students' future career development.

4.2. Ability Structure Requirements

4.2.1. Practical Skills Requirements

Practical ability is one of the important indicators for measuring the quality of mechanical engineering professionals. Students should possess strong engineering practical skills, being proficient in operating and maintaining various types of machinery, especially those within intelligent manufacturing systems. This includes CNC machine tools, industrial robots, automated production lines, etc. To cultivate these abilities, universities should strengthen laboratory construction, equip advanced experimental equipment, and involve students in the design and implementation of actual engineering projects through project-oriented teaching methods. For example, organizing students to participate in activities such as mechanical design competitions and innovation and entrepreneurship contests can enhance their hands-on practice capabilities and innovative thinking.

4.2.2. Innovation Capability Requirements

The era of intelligent manufacturing places higher demands on the innovative abilities of talents. Mechanical engineering professionals should have the capacity for independent thinking and innovative design, capable of finding new solutions to complex engineering problems. This requires not only solid theoretical knowledge and rich practical experience but also the courage to break through traditional thinking patterns. To this end, universities should encourage students to participate in scientific research projects and technological innovation activities, providing necessary financial support and guidance. Additionally, they can foster students' awareness and capability for innovation by offering courses in innovative thinking training, holding innovation workshops, and other means.

4.2.3. Lifelong Learning Capability Requirements

With rapid technological advancements, new technologies and processes continuously emerge in the field of mechanical engineering. To adapt to these changes, mechanical engineering professionals must have a lifelong learning capability. This requires students to have the ability to self-learn and continually update their knowledge, keeping up with industry trends and technological frontiers. Universities should cultivate students' independent learning abilities through multiple channels, such as offering online courses, organizing academic lectures, and establishing learning exchange platforms. Moreover, they should guide students to develop good learning habits and methods, enabling them to continue growing and developing in their future careers.

4.3. Quality Structure Requirements

4.3.1. Ideological and Moral Quality Requirements

Moral and ethical qualities are important aspects of measuring the comprehensive quality of talents. Mechanical engineering professionals should possess good professional ethics and a sense of social responsibility, adhering to engineering ethics norms and legal regulations. This includes honesty and integrity, dedication to one's job, and respect for intellectual property rights. Universities should guide students through ideological and political education courses and practical activities to establish correct values and outlook on life. For example, organizing volunteer service activities and social practice can enhance students' sense of social responsibility and service awareness.

4.3.2. Scientific and Cultural Quality Requirements

Scientific and cultural literacy is an indispensable part of mechanical engineering professionals. Students should have high scientific and cultural literacy and cross-cultural communication skills, understanding and respecting different cultural backgrounds, thinking patterns, and behavioural habits. This helps them better engage in international cooperation and exchange in a globalized context. Universities should improve students' scientific and cultural literacy and language abilities through humanities and social science courses and foreign language teaching. Additionally, they should encourage students to participate in international conferences and academic exchange activities to enhance their international perspective and cross-cultural communication skills.

4.4. Extraction of Key Capabilities in Talent

According to the new requirements of intelligent manufacturing for mechanical engineering professionals, the following key capabilities can be identified:

(1) Interdisciplinary knowledge integration ability: Intelligent manufacturing involves knowledge from multiple disciplines such as mechanics, electronics, computer science, and materials. Students need to have the ability to integrate and apply this knowledge comprehensively to understand and solve complex engineering problems.

(2) Data analysis and decision-making ability: Big data plays an important role in intelligent manufacturing. Students need to have the ability to collect, process, and analyse data, and make scientific decisions and optimizations based on data.

(3) Technical application and innovation ability: With the rapid development of intelligent manufacturing technology, students must not only master existing technologies and tools but also possess the ability to innovate and develop applications to adapt to future technological changes.

(4) Communication and collaboration ability: Modern manufacturing systems emphasize teamwork and interdepartmental communication. Students need to have good communication skills and teamwork abilities to work efficiently in diverse teams.

(5) Project management ability: Project management is a key link to ensure the efficient operation of manufacturing systems. Students need to understand the basic theories and methods of project management and have organizational coordination and resource management capabilities.

(6) Ethical and social responsibility: The development of intelligent manufacturing technology has brought many ethical and social issues. Students need to have good professional ethics and a sense of social responsibility, able to follow ethical norms and consider societal impact in engineering practice.

5. Strategies and Model Innovation for Mechanical Engineering Talent Training

5.1. Training Model of Interdisciplinary Integration

5.1.1. Necessity of Interdisciplinary Course Design

Intelligent manufacturing involves multiple disciplines such as mechanics, electronics, computer science, and materials. The knowledge of a single discipline is no longer sufficient to meet industry demands. Therefore, establishing an interdisciplinary curriculum system is particularly important. By integrating core knowledge points from different disciplines and offering comprehensive courses that cover multiple fields, we can broaden students' knowledge base and enhance their ability to solve complex engineering problems [9].

5.1.2. Specific Plans for Interdisciplinary Course Design

To achieve the goal of interdisciplinary curriculum design, the following specific measures can be taken:

(1) Introduce a modular course system: Teachers should break down core knowledge points from relevant disciplines into several modules, allowing students to choose different modules based on their interests and career plans. For example, “Robotics Technology” can be divided into modules such as mechanical structure design, control system development, and artificial intelligence applications.

(2) Offer interdisciplinary project-oriented courses: Teachers can use real projects to let students apply multidisciplinary knowledge to solve practical problems. For example, they organize students to design and build an intelligent robot, involving multiple aspects such as mechanical structure design, electronic circuit design, and software development.

(3) Establish an interdisciplinary mentorship team: The mechanical engineering department can hire teachers from different disciplinary backgrounds to form a mentorship team to jointly guide students in completing interdisciplinary projects. This not only improves the quality and level of the project but also promotes academic exchange and cooperation among teachers.

In summary, the multidisciplinary integration training model aims to cultivate students' comprehensive abilities by integrating knowledge from various disciplines such as mechanical engineering, information technology, computer science, and management. On one hand, this model can be implemented through establishing interdisciplinary courses, such as offering courses like “Intelligent Manufacturing Systems,” “Big Data Analysis and Application,” “Industrial Robots and Automation”; on the other hand, it encourages students to participate in interdisciplinary scientific research projects and problem-solving tasks to enhance their interdisciplinary thinking and innovation capabilities. Through a multidisciplinary integration model, students can not only master professional knowledge but also learn how to flexibly apply what they have learned in complex engineering environments.

5.2. School-enterprise Cooperation Training Model

5.2.1. Importance of University-enterprise Cooperation

School-enterprise cooperation is an important way to enhance students’ practical abilities and employment competitiveness. By establishing close cooperative relationships with enterprises, more internship and employment opportunities can be provided for students. At the same time, it allows enterprises to participate in the talent training process, jointly formulating training programs and teaching plans [10].

5.2.2. Implementation Strategies for University-enterprise Cooperation

To effectively promote school-enterprise cooperation, the following specific measures can be taken:

(1) Sign strategic cooperation agreements: Schools should sign long-term cooperation agreements with multiple enterprises to clarify the rights and obligations of both parties. The content of the agreement should include aspects such as internship base construction, joint scientific research projects, and faculty training.

(2) Jointly build practical training bases: Colleges and universities should establish practical training bases within schools to simulate real production environments, allowing students to engage with actual production equipment and processes during their time at school. For example, they can cooperate with local companies to establish intelligent manufacturing training centres equipped

with advanced CNC machine tools and industrial robots, providing a hands-on platform for students.

(3) Carry out industry-academia-research cooperation projects: Universities should encourage teachers to collaborate with enterprises in applying for scientific research projects and conducting joint problem-solving. This approach not only improves teachers' research capabilities but also drives technological innovation for enterprises. For instance, university professors can join forces with local enterprises to develop new control systems or devices, promoting the transformation of papers and patents into practical applications.

(4) Invite corporate experts to teach: Colleges and universities can regularly invite corporate executives and technical experts to give lectures or seminars on campus, sharing industry trends and cutting-edge technologies. This helps students understand the latest developments and enhances their interest and confidence in their knowledge. For example, universities can invite several renowned entrepreneurs each semester to give special reports, which not only broadens students' horizons but also helps them understand industry demands.

In summary, the school-enterprise cooperative training model can involve establishing long-term stable off-campus internship bases, inviting corporate experts to participate in curriculum design and teaching, and regularly organizing students to undertake internships and practical activities at enterprises. This allows students to stay updated with the latest industry technologies and demands while enhancing their practical skills and professional qualities. Additionally, enterprises can absorb outstanding students through this cooperative model, addressing the shortage of high-end talent.

5.3. International Vision Training Model

5.3.1. Necessity of International Cooperation and Exchange

With the acceleration of globalization, mechanical engineering professionals need to possess an international perspective and cross-cultural communication skills. Through international cooperation and exchange programs, students can be exposed to different cultures and technical standards from various countries and regions, broadening their international horizons. Additionally, by drawing on advanced foreign educational concepts and teaching methods, schools can improve their own teaching quality and standards [11].

5.3.2. Specific Measures for Internationalized Training

To achieve the goal of cultivating an international perspective, the following specific measures can be taken:

(1) Establish overseas internship bases: Universities form partnerships with renowned foreign universities or research institutions to set up overseas internship bases. Students can undertake short-term or long-term internships and practical training at these bases to understand advanced foreign technologies and management experiences.

(2) Launch international exchange student programs: Colleges and universities exchange students with foreign universities, allowing students to study abroad for a period. This not only improves their language skills and cross-cultural communication abilities but also lets them experience different educational systems and cultural atmospheres first-hand.

(3) Introduce high-quality foreign educational resources: Schools should invite well-known foreign professors to give lectures or conduct short-term training courses, and introduce excellent foreign teaching materials and course resources. Through this approach, students can enjoy world-class educational resources without leaving home.

(4) Encourage students to participate in international competitions: Colleges and universities organize students to participate in various international technology competitions and innovation and

entrepreneurship contests to enhance their international competitiveness and teamwork spirit. By participating in these competitions, students can not only hone their practical skills and innovative thinking but also make friends from all over the world, building international networks.

5.4. Innovative Entrepreneurship Education Model

5.4.1. Importance of Innovation and Entrepreneurship Education

Innovation and entrepreneurship education is one of the important links in cultivating high-quality mechanical engineering professionals. Through innovation and entrepreneurship education, students' innovative awareness and entrepreneurial spirit can be stimulated, fostering their courage and ability to explore unknown fields. This holds significant importance for driving technological progress and economic development [12].

5.4.2. Specific Methods for Implementing Innovation and Entrepreneurship Education

To effectively carry out innovation and entrepreneurship education, the following specific measures can be taken:

(1) Offer innovation and entrepreneurship courses: Schools should integrate innovation and entrepreneurship education into the compulsory curriculum system, teaching students innovative thinking methods and basic entrepreneurial skills. For example, courses such as “Foundations of Entrepreneurship” and “Innovative Thinking Training” can be offered to help students grasp key aspects and considerations in the entrepreneurial process.

(2) Organize entrepreneurship competitions: Schools regularly hold entrepreneurship competitions both within and outside the school to encourage students to propose innovative ideas and put them into practice. Through the format of competitions, this can stimulate students’ creativity and competitive spirit while also identifying potential projects for incubation and support.

(3) Establish entrepreneurial incubation platforms: Schools provide one-stop services such as venues, funding, and technical support for students with entrepreneurial intentions. By setting up entrepreneurial incubation platforms, students can overcome various difficulties and challenges encountered in the early stages of entrepreneurship. For instance, universities can collaborate with local governments to establish university student entrepreneurship parks, offering free office space and start-up funding support for resident student teams.

(4) Strengthen cooperation with enterprises: Schools should actively seek cooperative opportunities with enterprises to jointly promote the development and improvement of innovation and entrepreneurship education. For example, universities can enhance communication and collaboration with enterprises through co-building laboratories or joint research and development centres, achieving the goal of resource sharing and mutual benefits.

6. Implementation Pathways and Safeguard Measures

6.1. Policy Support and Guidance

Policy support and guidance are key to cultivating mechanical engineering talent for intelligent manufacturing. The state should issue relevant policy documents, clarifying strategic guidelines and specific measures. The government can encourage universities and enterprises through financial subsidies, tax incentives, and special funds. For example, setting up special funds to support university laboratories and training centres, and encouraging joint applications for major projects between universities and enterprises. Additionally, the government should formulate policies to attract overseas talents for teaching and research in intelligent manufacturing. Through these measures, a favourable educational and development environment is created, promoting the comprehensive development of mechanical engineering professionals.

6.2. Construction of University-enterprise Collaboration Mechanisms

Establishing a linkage mechanism between universities and enterprises is crucial for industry-education integration. Universities should form long-term stable cooperative relationships with enterprises, jointly developing talent training plans and implementation schemes. Both parties can engage in deep cooperation in curriculum development, internship training, and scientific research collaboration. They can also build high-level off-campus internship bases and industry-academia-research cooperation platforms. Additionally, universities should encourage teachers to take temporary positions in enterprises or participate in enterprise technology research and development to stay updated on industry demands and technological trends. This close cooperation creates a mutually beneficial, resource-sharing, and co-developing situation.

6.3. Faculty Construction

The construction of a faculty team is crucial for improving education quality and talent training levels. Universities should strengthen their faculty teams by attracting and cultivating high-level teaching and research talents. This includes intensifying the training of young teachers through academic exchanges and further studies, actively introducing high-level domestic and international talents, especially those with engineering practice experience and senior engineers from enterprises, and establishing flexible employment mechanisms to attract part-time teachers. These measures aim to build a well-structured, highly qualified, and dynamic faculty team, providing strong support for high-quality talent training.

6.4. Evaluation and Feedback Mechanisms

Establishing a sound evaluation and feedback mechanism is crucial for ensuring educational quality and continuous improvement. Universities should develop a scientific teaching evaluation system covering course content, teaching methods, faculty level, and student satisfaction. Regular teaching evaluations, student feedback, peer reviews, and alumni tracking surveys should be conducted to gather opinions. Timely and effective feedback mechanisms should be established to communicate evaluation results to relevant departments and personnel, formulate corrective measures, and supervise their implementation. This process forms a closed-loop management system, enhancing the quality of education and the effectiveness of talent training.

7. Conclusions

This paper systematically studies the talent cultivation strategies for mechanical engineering under the background of intelligent manufacturing. Through an analysis of the concept and development background of intelligent manufacturing, it clarifies the core characteristics of intelligent manufacturing and its new requirements for talents; by analysing the current status of talent cultivation, it identifies the main problems in the existing training model; combined with strategy innovations such as multi-disciplinary integration, university-enterprise cooperation, international perspective expansion, and innovation and entrepreneurship education, a series of effective training models are proposed; and from policy support, university-enterprise linkage, faculty team construction, and evaluation feedback mechanisms, four aspects discuss the implementation path and safeguard measures. The study shows that only through comprehensive measures and multiple initiatives can the quality of talent cultivation in mechanical engineering be effectively improved to meet the development needs of the intelligent manufacturing era.

Looking forward, as intelligent manufacturing technology continues to develop and deepen its application, the cultivation of talents in mechanical engineering will face more new opportunities and challenges. Future research could further focus on the following aspects: Colleges and universities should firstly, continue to deepen the research on multi-disciplinary integrated training models, exploring more effective interdisciplinary curriculum systems and teaching methods; secondly, they can strengthen the evaluation and optimization research of university-enterprise cooperation models to improve cooperation effectiveness and talent cultivation quality; thirdly, they should pay attention to the application research of emerging technologies in education, such as artificial intelligence, big data, virtual reality, etc., and their impact on educational model transformation; fourthly, they can conduct more empirical research and long-term follow-up surveys to verify the actual effects of training strategies and models, providing scientific basis for the formulation of educational policies. Through continuous research and practical exploration, colleges and universities continuously optimize and improve the talent cultivation system for mechanical engineering, providing a solid talent guarantee for promoting the transformation, upgrading, and high-quality development of China's manufacturing industry.

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