# Research on the Training Mode of Technical Talents in Small and Medium-sized Industrial Robot Enterprises — Cooperating with Vocational-oriented Education

**Xiangxin Hu[1], Jingyue Wang[2*]**

[1] School of International Business, Beijing Foreign Studies University, Beijing 100081, China

[2] Anhui Institute of Information Technology, Wuhu 241199, Anhui, China

DOI: 10.32629/memf.v4i5.1493

**Abstract:** This article takes small and medium-sized industrial robot enterprises in Shenzhen as a case study to deeply explore the design and implementation of school-enterprise collaborative education models. By conducting in-depth interviews and investigations of these enterprises, it can be found that their demand for talent goes beyond theoretical knowledge to emphasize practical skills and innovative thinking. The research shows such models can effectively improve students' practical abilities and employment competitiveness while contributing to the cultivation of skilled talents for small and medium-sized robot firms. However, there remains room for progress, as cooperation between schools and enterprises needs strengthening. Practical teaching quality and effectiveness requires optimization, and vocational education and assessments need closer alignment with business needs. To enhance the model, communication between schools and firms should deepen cooperative relationships. Focusing on cultivating practical skills through improved practical teaching is important. Relevancy and applicability of vocational training should also rise. With continued attention on industry developments and changing company needs, timely adjustments can maximize contributions to talent development and corporate success.

***Keywords*:** small and medium-sized industrial robot enterprises, human resources, vocational-oriented education

## 1. Introduction

With the continuous development and application of industrial robot technology, the demand for high-quality skilled talents in small and medium-sized industrial robot enterprises is increasing. However, there are currently some problems in the education of robotics in vocational colleges and technical schools in China, such as theoretical detachment from reality and insufficient practical abilities[1]. Therefore, how to establish an effective school enterprise collaborative education model and cultivate skilled talents that meet the needs of enterprises has become an urgent problem to be solved. This article takes small and medium-sized industrial robot enterprises in Shenzhen as the research object, and explores the design and implementation of a school enterprise collaborative education model. Firstly, the characteristics and needs of small and medium-sized industrial robot enterprises were analyzed; Secondly, the content of school enterprise cooperation mechanism, curriculum design, practical teaching mode, vocational oriented education, and evaluation system was proposed; Finally, the implementation effectiveness of this model was evaluated and summarized.

## 2. Characteristics and requirements of small and medium-sized industrial robot enterprises

Compared to large enterprises, small and medium-sized industrial robot enterprises have the characteristics of small scale, strong flexibility, and strong innovation ability[2]. However, due to talent shortages and high technological barriers, these enterprises face many difficulties and challenges in actual production. Therefore, the demand for high-quality skilled talents in these enterprises is increasing, mainly manifested in the following aspects.

### 2.1 Strong practical ability

Small and medium-sized industrial robot enterprises pay more attention to students' practical ability and skill level, requiring them to have strong practical operation ability and problem-solving ability. Small and medium-sized industrial robot enterprises have strict requirements for students' practical ability and skill level, and expect them to have excellent practical operation and problem-solving abilities.[3]These enterprises are well aware of the importance of practical experience for students to master practical skills, so they will provide more practical opportunities for students. Due to the relatively small scale of the enterprise, students can receive more practical training and opportunities to operate robots. In this environment,

students can deepen their understanding and application of robot technology through practical operations, and improve their skill levels. At the same time, small and medium-sized industrial robot enterprises focus on students' skill levels and practical operation abilities, as these abilities are crucial for the production and development of the enterprise.[4] Therefore, students need to actively participate in practical courses, internships, and practical projects, striving to improve their practical abilities and skills to meet the needs of small and medium-sized industrial robot enterprises.

### 2.2 Strong adaptability

The production environment and technical requirements of small and medium-sized industrial robot enterprises are often more complex, so students need to have the ability to quickly adapt to new environments and technologies. These students need to be able to master new technologies in a short period of time and apply them to practical production. They need to have flexible thinking and strong learning abilities to adapt to the constantly changing production environment and technical requirements. The production environment and technical requirements of small and medium-sized industrial robot enterprises are relatively complex, which requires students to have solid professional knowledge and rich practical experience. They need to understand the structure, principles, control methods, and other aspects of industrial robots, as well as master relevant programming and debugging skills. In addition, they also need to have the ability to solve practical problems and be able to carry out technical transformation and upgrading according to the specific needs of the enterprise. Due to the constantly changing production environment and technical requirements of small and medium-sized industrial robot enterprises, students need to have the ability to quickly learn new technologies. They need to constantly monitor industry dynamics and technological development trends, constantly update their knowledge reserves to adapt to the constantly changing production environment and technical requirements. At the same time, they also need to have flexible thinking and strong innovation ability to solve various problems encountered in actual production.

### 2.3 Strong innovation ability

Small and medium-sized industrial robot enterprises attach great importance to students' innovative thinking and ability. They hope that students can continuously exert their innovative abilities in practice, propose new ideas and solutions, and continuously improve and enhance their abilities through practice. In small and medium-sized industrial robot enterprises, employers place great importance on students' practical abilities. In enterprise practice, students not only need to master the basic knowledge of industrial robot technology, but also need to be able to apply theoretical knowledge to practice and solve problems in actual production. Therefore, small and medium-sized industrial robot enterprises pay more attention to students' practical and innovative abilities, which is why they prefer to recruit students with practical experience and innovative abilities.

## 3. Design and implementation of school enterprise cooperation mechanism

The school enterprise cooperation mechanism is an important guarantee for promoting collaborative education between schools and enterprises. It not only helps to improve the quality of talent cultivation, but also promotes the common development of both parties. This mechanism mainly includes important links such as the signing and execution of cooperation agreements, division of responsibilities between both parties, and information sharing mechanisms[5].

Firstly, the signing and execution of cooperation agreements are the foundation of the school enterprise cooperation mechanism. When signing a cooperation agreement, both parties need to clarify their respective responsibilities and obligations, and reach an agreement on issues such as cooperation duration, cooperation methods, and benefit distribution. In the process of implementing the cooperation agreement, both parties need to closely cooperate to ensure the smooth implementation of the agreement content.

Secondly, the division of responsibilities between both parties is an important link in the school enterprise cooperation mechanism. As two different entities, schools and enterprises have their own advantages and resources. Schools should be mainly responsible for theoretical teaching and the cultivation of basic skills, while enterprises should be mainly responsible for the cultivation of practical operations and professional skills. By clarifying the division of responsibilities, one can fully leverage their respective strengths and improve the quality and effectiveness of talent cultivation.[6]

Finally, the information sharing mechanism is a key link in the school enterprise cooperation mechanism. Schools and enterprises should establish close connections and timely exchange information on talent cultivation needs and job markets. Schools can understand market demand and industry trends through information provided by enterprises, and adjust teaching content and methods in a timely manner; Enterprises can learn about talent development plans and teaching outcomes through the information provided by schools, providing reference for talent selection and recruitment.

The specific implementation steps are as follows:

The first step is to establish a school enterprise cooperation committee or working group, which is jointly composed of the school and the enterprise, aiming to promote deep cooperation between the two sides in education, scientific research, talent cultivation, and other aspects. The members of the committee or group include leaders of schools and enterprises, education experts, industry experts, etc. They will jointly discuss cooperation matters, formulate cooperation agreements, and implement plans. The committee or group will hold regular meetings to discuss the progress of cooperation and promptly resolve any issues and difficulties that arise during cooperation. At the same time, they will actively promote communication and cooperation between schools and enterprises, promoting mutual benefit and win-win situation in education, scientific research, talent cultivation, and other aspects. By establishing a school enterprise cooperation committee or working group, schools and enterprises can better achieve resource sharing, complementary advantages, and jointly promote talent cultivation and social progress. This cooperation model can not only improve the quality of education, but also promote employment and economic development, with broad social significance and value.

The second step is to determine talent cultivation goals and plans based on the cooperation agreement, and develop detailed teaching plans and practical arrangements. In order to ensure the quality and effectiveness of talent cultivation, we have jointly discussed and developed a detailed talent cultivation goal and plan with our partners. Based on this plan, we have developed a teaching plan and practical arrangements to ensure that students can fully master the required skills and knowledge, and fully exercise and improve in practice. At the same time, we also focus on communication and coordination with our partners to ensure that talent development plans are closely integrated with actual needs and achieve the best results.

The third step is for schools and enterprises to implement teaching and practical training according to the plan, while maintaining close contact and collaboration. In this process, schools and enterprises need to cooperate with each other to jointly develop training plans and teaching plans, to ensure that the training content is closely combined with actual needs, and to achieve the best teaching and practical effects. At the same time, schools and enterprises also need to establish effective communication mechanisms and collaborative channels, timely solve problems and difficulties encountered during the training process, and jointly promote the smooth progress of training work. Through this approach, schools and enterprises can jointly cultivate high-quality talents with practical operational skills and innovative thinking, making greater contributions to future development.

The fourth step is to implement a periodic talent cultivation quality evaluation and feedback mechanism, continuously tracking and adjusting teaching quality to maximize students' learning effectiveness and career development prospects. In this process, we will conduct a comprehensive review and update of teaching content and methods in strict accordance with industry standards and actual needs, ensuring that students can obtain the latest, most practical, and most competitive knowledge and skills. At the same time, we will also attach importance to the personalized needs and development space of students, and provide targeted guidance and support for each student based on the principle of individualized teaching. Through this approach, its businesses and schools can create a more comprehensive and tailored learning experience for students that meets their future career development needs.

The fifth step, which is also the final step of the entire cooperation process, is to conduct a comprehensive summary and evaluation after the cooperation expires. This step not only affects whether the achievements and experiences of both parties' cooperation can be fully reflected, but also determines whether both parties can continue to cooperate or engage in deeper cooperation. Summary is a comprehensive review and sorting of the overall situation, completion status, problems encountered, and solutions of the cooperation project throughout the entire cooperation period. Evaluation is a quantitative evaluation of the effectiveness of cooperation based on the actual cooperation situation, including the results, efficiency, quality, and other aspects of cooperation. When summarizing and evaluating, both schools and enterprises need to fully consider various factors, such as whether the goals of the cooperation project have been achieved, whether communication is smooth during the cooperation process, whether the performance of the partners meets expectations, and whether the cooperation results are satisfactory. At the same time, we also need to conduct in-depth analysis of the problems and difficulties encountered in cooperation, and find corresponding solutions to provide experience and reference for future cooperation. After completing the summary and evaluation, the school enterprise will decide whether to continue cooperation or conduct in-depth cooperation based on the actual situation. If the cooperation results are good and significant, then we can consider continuing the cooperation; If there are problems or difficulties in cooperation, we can explore better solutions together.

In short, feedback and evaluation of the project is a crucial step in the entire cooperation process. It not only affects the results and quality of the cooperation, but also determines the future cooperation relationship and development direction of both parties. Therefore, when summarizing and evaluating, enterprises and schools need to treat every aspect comprehensively, objectively, and fairly to ensure the success and sustainable development of cooperation.

## 4. Adjustment and improvement of curriculum setting

It is crucial to adjust and improve the curriculum of the robotics major in response to the characteristics and needs of small and medium-sized industrial robotics enterprises. In the course design, we need to consider the characteristics of small and medium-sized industrial robot enterprises, such as small scale, strong innovation, high flexibility, and their demand for robot professionals, such as having a solid theoretical foundation, practical skills, and innovation ability.

In terms of basic theoretical courses, schools need to ensure that students can fully grasp the basic knowledge related to robots, such as mechanical structure, kinematics, dynamics, sensor technology, etc. In addition, in order to meet the needs of small and medium-sized industrial robot enterprises, we also need to focus on cultivating students' practical skills, including skills in robot programming, debugging, maintenance, and other aspects.

In terms of practical skills training courses, enterprises need to provide students with opportunities to operate robots in practice, so that they can learn and master the operating skills of robots in practice. In addition, we also need to focus on cultivating students' problem-solving abilities, so that they can quickly propose solutions and implement them when facing practical problems.

In terms of professional elective courses, schools need to set up courses based on the needs of small and medium-sized industrial robot enterprises and industry development trends, such as artificial intelligence, machine vision, the Internet of Things, and other courses. These courses can help students expand their knowledge, improve competitiveness, and better adapt to the needs of industry development.

In summary, it is necessary to adjust and improve the curriculum of the robotics major in response to the characteristics and needs of small and medium-sized industrial robot enterprises. Through reasonable curriculum design, both schools and enterprises can cultivate robot professionals with solid theoretical foundations, practical skills, and innovative abilities, providing strong support for the development of small and medium-sized industrial robot enterprises.

## 5. Research on practical teaching mode

The practical teaching mode is an important component of collaborative education between schools and enterprises. It is not only widely applied in the field of education, but also a key link in cultivating talents with practical operation ability and innovative thinking[7]. This model mainly includes the construction of internship and training bases, the introduction of mentor systems, and the implementation of practical projects. It can effectively combine theoretical knowledge with practical skills, improve students' comprehensive quality and employment competitiveness.

The construction of internship and training bases is the foundation of practical teaching mode. These bases can be practical laboratories on campus or internship positions within the enterprise. In the base, students can be exposed to advanced equipment and technology, understand the actual work environment and processes, and master relevant skills through practical operations. At the same time, the base can also provide students with education on professional literacy and ethics, helping them establish correct professional concepts.

The introduction of the mentor system is another important aspect of the practical teaching model. Under this system, students can practice and learn under the guidance of their supervisors.[7] Mentors can be teachers from schools or senior technical personnel from enterprises. They can provide professional guidance and advice to students, help them solve problems encountered in practical operations, and also impart the latest development trends and dynamics of the industry to students.

The implementation of practical projects is the core of the practical teaching model. By participating in practical projects, students can apply the theoretical knowledge learned in the classroom to practical work, deepening their understanding and mastery of professional knowledge. At the same time, practical projects can also cultivate students' teamwork ability and innovative thinking, improve their overall quality and employment competitiveness.

## 6. Summary

In order to meet the needs of small and medium-sized industrial robot enterprises, the school enterprise collaborative education model needs to be explored from multiple aspects. Firstly, we need to have a deep understanding of the needs of enterprises, including what kind of talents they need and what skills and knowledge these talents need to possess. Secondly, we need to focus on the construction of the teaching staff, including improving the professional literacy and teaching level of teachers, as well as strengthening cooperation with enterprises, so that teachers can better understand the needs and practical operations of enterprises. In addition, in order to ensure the quality of talent cultivation, we need to establish corresponding guarantee mechanisms, including monitoring and evaluation mechanisms for teaching quality, supervision and feedback mechanisms for student practice, etc.

In terms of curriculum design, schools need to adjust and improve according to the needs of enterprises, emphasizing practicality and applicability. At the same time, we also need to conduct in-depth research on practical teaching models, including through practical operations and case analysis, to enable students to better understand and master the technology and application of industrial robots. In addition, we also need to focus on career oriented education to help students better understand their career plans and career development paths. Finally, enterprises need to establish a comprehensive evaluation system with schools, including the evaluation of students' learning outcomes and the evaluation of teachers' teaching quality, in order to better understand the effectiveness and shortcomings of talent cultivation, and make timely adjustments and improvements.

In summary, through the comprehensive exploration and research above, it is expected that small and medium-sized industrial robot enterprises will gradually improve the school enterprise collaborative education model through cooperation with vocational schools, cultivate more high-quality talents suitable for the development of industrial robot enterprises, and promote the rapid development of the industrial robot industry.

## References


[1] Guowen Jing. Application of industrial robots and improvement of total factor productivity in manufacturing enterprises [J]. Enterprise Economy. 2023; (10): 105-114.

[2] Chenyu Chen. The impact of industrial robot applications on the performance of manufacturing enterprises [J]. Market Weekly. 2023; 36 (09): 14-17.

[3] Qiyun Fang, Ziang Cheng, Yang Hu. Expansion of Human Capital, Industrial Robots, and Quality of Enterprise Export Products [J]. International Trade Issues. 2023; (06): 18-33.

[4] Dongsheng Liu. (2023) Research on the Impact of Industrial Intelligence on Labor Mobility [D]. Ph.D.Thesis, Anhui University of Finance and Economics, Hefei.

[5] Ran Li, Haibing Yuan, Junbao Chen, Yong Chen. Exploring the Cultivation of Applied Talents for the Integration of Industry and Education in Industrial Robotics [J]. Modern Commerce and Industry. 2023; 44 (10): 257-260.

[6] Min Liu, Yaonan Wang, Xiaogang Zhang, Qiaokang Liang. Construction and practice of a three-dimensional collaborative education system in the field of robotics [J]. Journal of Higher Education. 2023; 9 (22): 1-4.

[7] Baohui Wang, Chong Liu, Qihao Wang, Yuanmi Chen. Research and analysis of talent demand in the robot industry under the OBE concept [J]. Higher Engineering Education Research. 2023; (04): 65-72.