

# The Real Dilemmas and Breakthrough Paths of Technology Transfer in Higher Vocational Colleges

Xiao Zhang, Hongyan Liu\*, Lingzhao Deng

Shenzhen Polytechnic University, Shenzhen 518000, Guangdong, China

\*Corresponding author: Hongyan Liu, zhxiao221@126.com

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**Abstract:** Scientific and technological innovation and achievement transformation have become the key elements to enhance national comprehensive strength. This paper focuses on the characteristics, realistic dilemmas, and breakthrough paths of Chinese higher vocational colleges in the process of transformation of scientific and technological achievements. It is found that higher vocational colleges have the characteristics of regional economic development, focusing on applied technology, diversified scientific research teams, and rapid development of scientific research forces. However, in terms of the transformation of scientific and technological achievements, there are still problems such as insufficient transformation strength, poor compatibility between achievements and market demand, insufficient financial support, and poor transformation channels. To solve these problems, this paper proposes strategies such as increasing scientific research investment, deepening school-enterprise collaboration, broadening fundraising channels, and strengthening the construction of professional institutions, to improve the transformation ability of scientific and technological achievements in higher vocational colleges and better serve the national and regional economic development.

**Keywords:** Higher vocational colleges; Transformation of scientific and technological achievements; School-enterprise cooperation; Promotion strategy

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## 1. Introduction

In today's international competition, scientific and technological innovation capability has become an important index to measure a country's core competitiveness. China is vigorously promoting the strategy of innovation-driven development. The effective transformation of scientific and technological achievements is a necessary link to ensure the implementation of scientific and technological innovation and promote economic development<sup>[1]</sup>. From the perspective of the development trajectory of the world's leading economies, universities are not only pioneers of technological innovation and important bases for personnel training but also important promoters of transforming scientific and

technological achievements into productive forces. At present, some developed countries have established a mature and efficient system for the transformation of scientific and technological achievements in universities through various means such as legislative guarantees and the construction of intermediary institutions. However, the transformation system of scientific and technological achievements in Chinese universities is still in the stage of development, with a limited number of full-time transformation institutions and different levels, and the overall transformation efficiency needs to be improved <sup>[2]</sup>. Therefore, it is urgent to strengthen the transformation ability of scientific and technological achievements in Chinese universities.

Higher vocational education is an important part of China's higher education, which is of great significance for supporting the national strategy, integrating into local development, and promoting industrial upgrading. Higher vocational colleges have the characteristics of being regional, applied, and serving small, medium, and micro enterprises, thus forming the advantages of applied research and technology transformation <sup>[2]</sup>. However, in reality, the contribution of most higher vocational colleges in promoting the transformation of scientific and technological achievements into productive forces is still insufficient, and the expected goal of serving enterprises and regional industrial transformation and upgrading has not been reached. Based on this background, on the basis of combing the characteristics of scientific research in higher vocational colleges, this study analyzed the challenges existing in the transformation of scientific and technological achievements and proposed corresponding breakthrough paths, to improve the energy efficiency of the transformation of scientific and technological achievements in higher vocational colleges and make better contributions to national and regional development <sup>[3]</sup>.

## **2. Characteristics of scientific research work in higher vocational colleges**

### **2.1. Close to the local industry**

The core mission of higher vocational colleges is to serve the regional economy, especially the small, medium, and micro enterprises in the region. Their scientific research work closely focuses on the technical needs of the local leading and characteristic industries and focuses on solving the practical problems of industrial upgrading and enterprise production. Through close cooperation with enterprises, such as jointly researching and developing new products and optimizing production processes, they provide technical support for enterprises and promote local economic development <sup>[4]</sup>.

### **2.2. Focus on application technology**

Different from undergraduate colleges, which focus on basic theoretical research, vocational colleges focus on the research and development of applied technology. Oriented by solving practical production problems, scientific research results pay more attention to practicability and economic benefits. Such as research and development of new equipment and new technology, can be directly applied to enterprise production and quickly transformed into productive forces <sup>[5]</sup>. These results come in various forms, covering patents, technical reports, etc., which can quickly meet the needs of enterprises for new technologies, shorten the technology update cycle, and enhance the competitiveness of enterprises.

### **2.3. Diversified scientific research team**

Most teachers in higher vocational colleges are "double-qualified" teachers, who have both solid theoretical knowledge and rich practical experience <sup>[5]</sup>. They are good at guiding students to participate in practical links such as internships, practical training, or innovation and entrepreneurship competitions. Through these practical activities, students

can apply the professional knowledge they have learned to solve practical problems, to improve their practical and innovative ability. In addition, higher vocational colleges cooperate closely with enterprises, often inviting the technical backbone of enterprises to participate in the school's scientific research projects, and the two sides jointly carry out technology research and development and product innovation work, which not only promotes the transformation and industrialization of scientific research results but also forms a complementary scientific research cooperation mode.

#### **2.4. The scientific research strength is developing rapidly, but there is still room for improvement**

Compared with the research-oriented undergraduate colleges, the scientific research strength of vocational colleges is relatively weak, but in recent years, the development momentum has been strong, which is reflected in the improvement of the introduction of teachers' qualifications, the addition of full-time researchers and the formation of scientific research teams, the increase in the number of scientific research results, and the increasingly rich innovation content. Overall, however, there is still much room for improvement in terms of scientific research quality, academic influence, and internationalization level <sup>[6]</sup>.

### **3. There are challenges in the transformation of scientific and technological achievements in higher vocational colleges**

In the whole process of the transformation of scientific and technological achievements, the output of scientific and technological achievements is the foundation, the evaluation and screening of achievements is the basis, the implementation and promotion of transformation is the key, and industrialization and marketization are the goals <sup>[7]</sup>. The object of transformation of scientific and technological achievements is the scientific and technological achievements themselves, covering new technologies, new processes, new materials, and so on. Participants include exporters of scientific and technological achievements, such as research institutes and schools; Importers, such as enterprises; And service providers that help transform scientific and technological achievements, such as governments, financial institutions, and third-party service organizations. Combined with the process and main body of the transformation of scientific and technological achievements, the current transformation of scientific and technological achievements in higher vocational colleges is faced with the following problems.

#### **3.1. The transformation of scientific and technological achievements is not good**

Higher vocational colleges have a short history of running schools, and their overall development started late. They mainly focus on professional construction and personnel training, and their scientific and technological research and development are relatively weak. The specific performance is as follows: First, higher vocational colleges mainly focus on teaching, less investment in scientific research, relatively high teachers, heavy teaching tasks, teachers do not have enough time and energy to invest in science and technology research and development. Second, the teachers' scientific research mentality is more conservative, satisfied with the declaration of topics, published papers, and patent applications, there is a psychological fear of scientific and technological achievements transformation. Third, higher vocational colleges lack leading scientific research talents and high-level scientific research platforms, and it is difficult to form tight research and development teams, resulting in the scarcity of high-level achievements and insufficient reserves of transformable scientific and technological achievements <sup>[9]</sup>. Therefore, the lack of overall technology research and development ability has become a major shortcoming limiting the scientific and technological

service ability of higher vocational colleges.

### **3.2. The scientific and technological achievements do not fit the market demand well**

On the one hand, as a supplier of scientific and technological achievements, vocational colleges lack a direct incentive mechanism for in-depth docking with enterprises, which will lead to the lack of market orientation in technology research and development, and most of the achievements stay in the laboratory stage, with low compatibility with the needs of enterprises. At the same time, the number of pilot platforms in China is small, and it is difficult for enterprises to undertake the achievements of colleges and universities. On the other hand, as the demand side of scientific and technological achievements, enterprises are often more willing to cooperate with undergraduate institutions with strong scientific research strength when they need the support of scientific and technological achievements. At present, the school-enterprise cooperation between vocational colleges and enterprises is mostly at the superficial level, and the common forms include carrying out short-term project cooperation and accepting students' short-term internships and training, but the cooperation framework based on long-term and systematic planning is lacking. In this kind of short-term cooperation, enterprises cannot fully understand the research director of the school, and the school cannot gain insight into the actual needs of enterprises.

### **3.3. Insufficient financial support**

The research and development funds of higher vocational colleges mainly rely on financial allocation, and the sources and channels are limited. Compared with European and American countries, China's social capital is less involved in scientific research, especially the enterprise capital is insufficient to support technical research and development in higher vocational colleges. In addition, new technologies and products need to go through the pilot stage from the laboratory to the market, which requires a lot of capital investment and repeated trials. However, small, medium, and micro enterprises are unwilling to bear the cost of pilot tests, and vocational colleges themselves lack pilot test conditions, resulting in the transformation of some results cannot complete the test link, and the technical feasibility and rationality of the demonstration are limited<sup>[10]</sup>. The transformation of scientific and technological achievements has the characteristics of high risk and high growth and needs the support of professional venture capital institutions. However, at present, it mainly relies on government funds and lacks scientific and technological financial tools.

### **3.4. The channels for the transformation of scientific and technological achievements are not smooth**

There are many obstacles to the transformation of scientific and technological achievements in higher vocational colleges. First of all, most colleges lack departments or full-time personnel who are specifically responsible for the transformation of scientific and technological achievements, and the related responsibilities are often taken into account by the scientific research management department. However, the transformation of scientific and technological achievements is a highly professional and complex work, and it is difficult for the scientific research management department to fully meet its professional and comprehensive needs, which limits the possibility of effective transformation of scientific and technological achievements. Secondly, the information communication channels between vocational colleges and enterprises are not smooth, and it is difficult to promote the achievements of schools and transfer the needs of enterprises. Finally, as intermediaries tend to prefer to cooperate with well-known institutions with deep scientific research backgrounds and rich achievements, vocational colleges are at a disadvantage in obtaining market information and seeking intermediary services<sup>[11]</sup>.

## **4. Strategies for improving the transformation ability of scientific and technological achievements in higher vocational colleges**

### **4.1. Increase the investment in scientific research resources and strengthen the construction of scientific research teams**

Higher vocational colleges need to increase investment in scientific research in an all-round way, covering key areas such as capital, advanced equipment, and allocation of human resources. Create a campus atmosphere that attaches importance to scientific research, establish incentive mechanisms, such as setting up special research funds, implementing a reward system, and taking scientific research contributions into consideration in the evaluation of professional titles, to fully mobilize the enthusiasm of teachers. Encourage teachers to cooperate with enterprises to carry out research projects with high application value, and form a stable research and development direction. At the same time, the university actively introduces leading scientific research talents, builds high-level research platforms, sets up close-knit research teams, carries out systematic and organized research work, and comprehensively improves the overall scientific research strength of the university<sup>[12]</sup>. At the same time, the university has strengthened the training and encouragement of teachers in scientific research, changed their conservative ideas, and encouraged them to boldly explore the path of transforming scientific and technological achievements.

### **4.2. Strengthen market orientation and optimize school-enterprise cooperation mode**

Higher vocational colleges should establish market-oriented research and development concepts, take the initiative to deeply investigate enterprises, accurately grasp the actual technical needs of enterprises, and flexibly adjust the direction of scientific research accordingly. Actively jointly declare scientific research projects with enterprises, jointly carry out technical research, to ensure that the research and development results can directly solve the practical problems of enterprises, and enhance the market adaptability of scientific and technological achievements. Strengthening the construction of pilot platforms can solve the problem of an insufficient number of pilot platforms by co-building with enterprises and winning government support. In addition, explore the establishment of a long-term and stable school-enterprise cooperation mechanism, and encourage enterprises to participate in the establishment and implementation of scientific research projects in higher vocational colleges. Resources sharing and technology docking should be realized through the joint construction of industrial colleges and the establishment of joint laboratories or research and development centers<sup>[13]</sup>.

### **4.3. Expand diversified financing channels and strengthen financial support**

The government should play a leading role in jointly building pilot bases with enterprises and private capital, lowering the threshold for SMEs to participate, and improving the efficiency of translating results. Based on relying on financial allocations, the government should actively seek the injection of social funds, such as venture capital and angel funds, to provide adequate financial support for projects with potential<sup>[14]</sup>.

### **4.4. Strengthen the construction of professional institutions and talents, and improve the information communication mechanism**

Higher vocational colleges should set up specialized institutions for the transformation of scientific and technological achievements, staffed with professionals, responsible for the evaluation, promotion, docking, and transformation of scientific and technological achievements. At the same time, they should strengthen cooperation with specialized technology transfer institutions to learn advanced experience and improve transformation efficiency. Establish and improve the regular communication mechanism with enterprises, such as actively organizing and participating in the

scientific and technological achievements matching meetings, industry-university-research cooperation forum, and other activities, timely and comprehensively introduce the scientific and technological achievements of the university to enterprises, and deeply understand the technical needs of enterprises<sup>[15]</sup>. In addition, make full use of the professional advantages and extensive resource network of intermediary agencies, strengthen cooperation, and provide all-round, one-stop quality services for the transformation of scientific and technological achievements.

## 5. Conclusion

The transformation of scientific and technological achievements is not only the only way for higher vocational colleges to implement the innovation-driven development strategy, but also the core driving force for the regional economy to achieve high-quality growth, and the key way to enhance their comprehensive competitiveness. Looking forward to the future, higher vocational colleges should actively respond to the national innovation-driven development strategy, continue to strengthen market demand research, and integrate the transformation of scientific and technological achievements into daily teaching and research activities. The government, financial institutions, and enterprises should also work together to provide policy support, financial guarantees, and technical guidance for the transformation of scientific and technological achievements in higher vocational colleges. Only when all parties form joint efforts can the industry fully tap the potential of higher vocational colleges in the field of scientific and technological innovation, promote the efficient transformation of scientific and technological achievements into real productive forces, and contribute to the high-quality development of the national and regional economy.

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