# *Research on the Sharing Mechanism of Vocational Education Resources Supported by Artificial Intelligence*

**Kun Liu\*, Jingxia Chen, Mengjun Wei, Xiangyu Chen**

*College of Applied Science and Technology, Beijing Union University, Beijing, China*
*\*Corresponding author*

*Abstract:* With the rapid development of artificial intelligence technology, "artificial intelligence+vocational education" has attracted more and more attention throughout the country. In the rapidly developing digital age, vocational education resource sharing should be deeply integrated with artificial intelligence technology to innovate the concept of vocational education resource sharing. Data and cloud computing technology, artificial intelligence, machine learning, Internet of Things technology and VR virtual reality technology are integrated with vocational education resource sharing, and vocational education resource sharing services based on artificial intelligence technology are gradually created. In this paper, the present situation and existing difficulties of vocational education sharing in Beijing, Tianjin and Hebei are discussed in detail, and on this basis, the way to realize vocational education resource sharing based on artificial intelligence technology is put forward.

## 1. Overview of the Coordinated Development of Beijing Tianjin Hebei

After the official introduction of the "Beijing Tianjin Hebei Collaborative Development Outline" in 2015, the three regions of Beijing Tianjin Hebei officially began to implement the guiding plan of radiating from the advantages of the capital and relaxing noncore functions of the capital[1]. According to the guidance of the outline, the specific plan for the coordinated development of Beijing Tianjin Hebei must clarify the functional status of the three regions, coordinate the industrial layout and urban development of the three regions, so that their division of labor and joint efforts can be achieved, and the comprehensive carrying capacity and connotation development level of the city can reach the best state. All of these layout adjustments and pattern changes will inevitably be accompanied by the migration of a large number of people. Education resources are an important influencing factor of population mobility. Therefore, the reasonable establishment of the Beijing Tianjin Hebei education resource co construction and sharing mechanism is very important for the efficiency and effectiveness of coordinated development among the three regions[2].

The coordinated development of Beijing Tianjin Hebei is one of the major development strategies currently implemented by the country. Guided by the "Outline of the Beijing Tianjin Hebei Coordinated Development Plan", it promotes the development of various fields or industrial chains such as public services, transportation, entrepreneurship, and ecology, and has achieved significant results. For example, promoting the use of the Beijing Tianjin Hebei transportation, one

card has now covered 9 cities, and the integrated transportation network of the three places is being accelerated. In the field of healthcare, with the strong cooperation of medical and health organizations in the three regions, multiple cooperation projects have been successfully launched and gradually promoted. In addition to transportation and healthcare, phased achievements have also been made in the sharing of educational resources in the Beijing Tianjin Hebei region[3-5].

The coordinated development of education in Beijing, Tianjin and Hebei has taken the "equalization of education services" as the main direction. From 2014 to 2019, Beijing Jingshan School Caofeidian Branch was successfully established and began to recruit students; Six vocational colleges in Hebei Province have officially joined the Beijing Transportation Vocational Education Group; Beijing Normal University has successfully established a basic experimental school in Wuqing, Tianjin; Beijing University of Chemical Technology officially started construction of Qinhuangdao Campus, and Chongli County People's Government of Zhangjiakou City and School of Tourism of Beijing Union University jointly signed a strategic cooperation framework agreement on tourism education. In short, the coordinated development of education in the three regions of Beijing, Tianjin, and Hebei is mainly achieved through the establishment of alliance schools. As of 2020, more than 100 kindergartens, primary and secondary schools, and vocational schools have been assisted, and the overall scale of educational coordinated development is gradually expanding.

## 2. Summary of Vocational Education in Beijing Tianjin Hebei

The collaborative development model of Beijing Tianjin Hebei is not the first in China. After comparing the collaborative development experiences of the "Yangtze River Delta" and "Pearl River Delta" regions, it was found that the current integration process of Beijing Tianjin Hebei is relatively lagging, especially in the allocation of educational resources, and the uneven distribution of resources is more obvious.

Through the comparative analysis of the differences in higher vocational education resources among the three regions in Table 1, it can be found that the number of vocational colleges in Hebei is significantly higher than that in Tianjin and Beijing. The population and number of graduates in Hebei region are significantly higher than those in Tianjin and Beijing. However, in terms of student teacher ratio, the teacher-student ratio in Hebei region is in a serious imbalance, and the insufficient number of teachers will be detrimental to the improvement of teaching quality. In terms of public financial budget expenditure for teachers and students, Hebei region has the highest number of students, but the per capita education expenditure is the lowest, only 7600 yuan, far lower than the 40300 yuan in Beijing region, which indicates a significant imbalance in education investment. The average education budget expenditure per student in Beijing is significantly higher than that of the other two provinces and cities.

By comparing the development status of secondary vocational education in the three regions of Beijing, Tianjin, and Hebei, as well as across the country, Table 2 shows that the number of vocational colleges in Hebei region is significantly higher than that in Tianjin and Beijing. At the same time, the population and number of graduates in Hebei region are significantly higher than those in Tianjin and Beijing. In the comparative analysis of instrument and equipment asset values, we found that there are significant differences in instrument and equipment asset values among the three regions. The instrument and equipment asset values in Tianjin are significantly lower than those in the other two provinces and cities, with Hebei Province being the highest province. This is due to the fact that Hebei is a major province of education and has a large number of vocational colleges.

Table 1: Comparison of higher vocational educational resource differences

| Region | Population (10000) | Number of Colleges | Number of Graduates (10000) | Student-Teacher Ratio | Per Student Public Finance Calculation (10000 yuan) |
|---|---|---|---|---|---|
| Beijing | 2070 | 26 | 3.65 | 14.61 | 4.03 |
| Tianjin | 1412 | 26 | 5.38 | 17.31 | 1.39 |
| Heibei | 7289 | 61 | 18.91 | 18.11 | 0.76 |
| Countrywide | 135403 | 1321 | 318.65 | 17.21 | 1.00 |

Table 2: Comparison of Secondary vocational educational resource differences

| Region | Population (10000) | Number of Colleges | Number of Graduates (10000) | Student-Teacher Ratio | Per Student Public Finance Calculation (10000 yuan) |
|---|---|---|---|---|---|
| Beijing | 2070 | 97 | 7.55 | 8.42 | 4.02 |
| Tianjin | 1412 | 83 | 3.94 | 4.62 | 1.40 |
| Heibei | 7289 | 636 | 33.72 | 5.28 | 0.77 |
| Countrywide | 135403 | 1321 | 555.57 | 6.86 | 1.01 |

In the comparison of average student budget education expenses, there is a significant difference in the average student education expense index among the three regions. Hebei Province's budget expenditure is significantly lower than the other two provinces and cities.

From the above analysis, it can be seen that there are significant differences in the allocation of educational resources among the three regions of Beijing, Tianjin, and Hebei. In addition to the aforementioned differences, there are significant differences in the allocation of educational resources among the three regions in terms of subject authorization points, high-level teachers, platforms, and higher education funding[6,7]. In terms of the allocation of education funds, the allocation of education funds in universities is based on the economic strength of the region and the number of "211" and "985" universities. This is currently the case in China.

An important reference direction for the allocation of educational funds, this method of allocating educational funds has seriously hindered the rationality of the allocation of educational funds in universities in the Beijing Tianjin Hebei region. The number of "211" universities in Beijing is significantly higher than that of Tianjin and Hebei, which is 7.7 times of Tianjin and 23 times of Hebei. This has led to a significant increase in overall funding expenditure in Beijing compared to Hebei and Tianjin. In addition, there are significant differences in the number of doctoral and master's degree granting points among the three regions, which also leads to imbalanced educational resources and affects the coordinated development of the three regions.

## 3. The Dilemma of Sharing Vocational Education Resource in Beijing Tianjin and Hebei

As an important base for cultivating highly skilled talents, vocational education bears the responsibility of cultivating talents for the coordinated development of Beijing Tianjin Hebei. In recent years, the three regions of Beijing Tianjin Hebei have achieved certain results in the sharing, cooperation, development, and construction of vocational education resources, built a large number of platforms for industry, academia, and research exchange, and promoted the development of educational informatization. However, the depth and breadth of vocational education resource sharing in Beijing Tianjin Hebei are not enough, and the concept of collaborative and shared development needs to be further strengthened, and the sharing mechanism needs to be further improved. Therefore, building a more efficient and smooth resource sharing mechanism across administrative division is the fundamental guarantee for narrowing the gap in regional vocational education, promoting in-depth cooperation in educational resources, and building a regional modern education system with international competitiveness.

The shared development of vocational education in the Beijing Tianjin Hebei region involves different administrative regions, different administrative and educational entities, industries and enterprises in different economic environments, different levels of education recipients, and multiple interest groups with different demands for benefits. However, the talent cultivation of vocational education has long-term and lagging characteristics. Therefore, in order for vocational education in Beijing Tianjin Hebei to achieve collaborative development and resource sharing, it is bound to go through a difficult process.

(1) The vocational education resources in Beijing, Tianjin, and Hebei are scattered and have a low degree of sharing.

Due to differences in economic and social development levels, developed regions tend to exclude and restrict entry in relatively underdeveloped areas, in order to ensure the exclusive enjoyment of resources within the region. Due to differences in geographical location and economic development level, Beijing and Tianjin have gathered a large number of advantageous resources. Not only do they have distinctive vocational colleges, but they also include leading educational concepts, top-notch teaching resources and equipment, and high-quality teaching teams. They have a significant siphon effect on the surrounding areas, but their external radiation function is not strong. Hebei has relatively few educational resources, and there is a significant gap in education scale and investment compared to Beijing and Tianjin. Hebei has only a large number of students, making Hebei an important source of low-end industrial human resources for the two regions. Therefore, there is a value choice in the sharing of vocational education resources in the Beijing Tianjin Hebei region, which makes it difficult to carry out deep communication and cooperation between regions, resulting in uneven resource allocation. This requires promoting the balanced distribution of vocational education resources between regions, expanding the coverage of educational resource sharing as much as possible, and achieving "dislocation" and "complementarity" of educational resources.

(2) Lack of awareness of resource sharing and collaboration among educational subjects.

The coordinated development plan of Beijing Tianjin Hebei has different functional positioning for the three provinces and cities, resulting in significant differences in their ideological understanding. There is a strong sense of cooperation in the economic field, while there is a lack of cooperation in the cultural and educational fields. There is a significant lag in the coordinated development of education compared to the coordinated development of the economy.

The coordinated development strategy of Beijing Tianjin Hebei has been implemented for many years. The three governments and education departments have jointly signed and released a series of documents on resource sharing and cooperation, carried out various forms of communication and cooperation, and achieved some results. However, more cooperation is for the sake of cooperation, rather than spontaneous cooperation among education entities. Therefore, in the practice of resource sharing, due to a lack of overall awareness, weak sharing concepts, and a focus on one's own interests, cooperation becomes mere formality. As the saying goes, ideas are the precursor of action, and failure to rationalize and reach consensus on ideas can lead to lag in action. Therefore, mobilizing the enthusiasm of educational subjects, recognizing the importance of education in economic development, and effectively strengthening sharing and innovation in the field of education can become the backing of economic development.

(3) The institutional mechanism for sharing vocational education resources in Beijing Tianjin Hebei is not sound.

The vocational colleges and educational resources in the Beijing Tianjin Hebei region still belong to the education departments under their respective administrative management systems. There is a clear localized management pattern in policies and regulations, subject settings, enrollment plans, and fund allocation, lacking top-level design and overall planning. In addition, different school owners have different interests and demands, which makes it difficult to form a balance of interests among various subjects. In the absence of sound motivation, cooperation, collaboration, and guarantee mechanisms, it is urgent to clarify the needs, interests, and cooperation

methods of all parties, establish a system and mechanism for sharing vocational education resources among the three regions, strengthen communication and cooperation among vocational colleges, and build a networked, integrated, and socialized vocational education system in education concepts, talent cultivation, teacher exchange, school enterprise cooperation, and social services. Then we can promote mutual benefit and win-win situation among various universities.

(4) The benefits of sharing vocational education resources in Beijing Tianjin Hebei are narrow.

At present, the sharing of vocational education resources in the Beijing Tianjin Hebei region is limited to universities and majors with certain cooperation conditions. The sharing platforms are few, the scope is small, the content is single, and the benefits of resource sharing are narrow, making it difficult to stimulate the enthusiasm of various universities to participate in sharing cooperation. In terms of teaching software and hardware, digital resources such as books and literature, online courses, etc. are not limited by geography and can be shared. However, hardware such as public teaching venues and training rooms, teaching equipment, and instruments can only be shared among similar universities. However, due to the management and maintenance of equipment, it is difficult to divide responsibilities in case of problems, resulting in difficulty in sharing hardware teaching resources.

In terms of teaching staff, due to differences in public service policies such as finance and taxation, personnel and medical care, elderly care, and transportation among regions, the staffing and benefits of teacher mobility are different. High quality teacher resources have flowed to the Beijing Tianjin region with good living conditions and high welfare benefits, making Hebei a scarce destination for attracting high-quality teacher resources. In terms of enrollment, in recent years, due to the decline in the birth rate of the population, the number of students taking the college entrance examination has also decreased. In order to seize high-quality students, competition among vocational colleges has become increasingly fierce, making it difficult to achieve student source sharing.

(5) Regional administrative barriers exist, and educational resources are unevenly distributed across regions.

The Beijing Tianjin Hebei region belongs to different administrative regions, with significant development gaps and a lack of unified management systems and institutions. The education industry in various regions mostly focuses on the local education situation and implements targeted development strategies and policies. The construction of an educational resource sharing mechanism may result in restrictive factors such as resource closure, uneven resource allocation, and significant resource differences, which hinder the smooth operation of enterprise cooperation and hinder communication and exchange. Moreover, the different development models implemented for a long time have resulted in a huge gap in talent employment, faculty construction, and education level between Beijing, Tianjin, and Hebei. Specifically, the Beijing Tianjin region has a fast economic development speed and abundant educational resources, while the Hebei region has too few educational resources and uneven investment in education. Although Hebei, as a populous province, has advantages in terms of student resources, it still has serious shortcomings compared to the other two regions in terms of data such as education funding and per capita equipment construction due to the impact of regional development strategies. Urban areas have relatively abundant resources, while towns and rural areas lack educational resources

There is a significant gap in educational resources between the three regions of Beijing, Tianjin, and Hebei. There is also an uneven distribution of resources between urban and rural areas. How to expand the coverage area of resource sharing, narrow the gap between regions and urban and rural areas through rational allocation of resources, so that all regions can enjoy equal educational opportunities, and reduce educational unfairness is the main problem to be solved in building the integrated development pattern of education in Beijing Tianjin Hebei, promoting education resource sharing, and also the main link to promote the development of China's education industry and maintain the stability of the education environment in various regions.

(6) Lack of effective coordination, and the integration of educational resources needs to be

strengthened.

The different educational advantages in different regions result in significant differences in the demand for resources in universities within the region. Colleges and universities invest a large amount of financial and energy in the process of resource construction, resulting in different quality of resources, but most of them serve various types of education and mobility in their own institutions. Therefore, the development of resources has a certain degree of pertinence. In the process of cooperative development, for resource sharing, due to the fact that universities act independently, data incompatibility and insufficient utilization of resources are prone to occur in the process of resource transmission. In response to this issue, there is no mechanism for coordination among regions, and there are no relevant organizations and departments for resource sharing. As a result, communication among education entities in each region is mostly individual behavior, and the sharing and transmission of resources in the three regions lack internal support. At the same time, the sharing and co construction of resources is not simply a summary of resources from various regions, achieving a reasonable and equal distribution of resources. Instead, it is necessary to analyze the advantages of resources, choose content that is more suitable for regional education, integrate and apply resources, and leverage resource advantages.

This requires the construction of a comprehensive coordination mechanism in the Beijing Tianjin Hebei region. Through the integration and reconstruction of resources, the point-to-point transmission of resources is achieved to meet the needs of regional development. At the same time, it is important to maximize the integration of various resources, achieve the ultimate goal of resource sharing, and promote the high-quality development of education in the Beijing Tianjin Hebei region.

## 4. Vocational Education Resource Sharing Based on Artificial Intelligence Technology

(1) Using big data technology to strengthen data integration management of resource platform.

The construction of vocational education resource sharing platform should realize the analysis, processing, screening and optimization of resources. Good resources need to be retained and disseminated. Resources without development potential will be eliminated after the analysis of big data technology. We can use the data integration technology of big data technology to classify the mixed education and teaching resources, so as to facilitate users' use and reference[7].

(2) Using artificial intelligence technology to promote intelligent resource sharing platforms Artificial intelligence.

Based on users' usage habits and browsing history, we analyze their learning situation and level, accurately depict user profiles, recommend personalized service resources for users, simplify the steps of searching for resources, save users' search resources, and enhance their good learning experience [8].

(3) Utilizing machine learning technology to enhance the humanization of resource sharing platforms.

By using machine learning technology, we can gain a deep understanding of users' needs, analyze their common search terms, download views, clicked links, and forwarded information, and accurately grasp their needs to provide professional recommendations [9,10].

(4) Leveraging the core advantages of IoT technology.

Through remote interactive systems, schools or classes can learn together and share high-quality teaching resources from around the world. This will enable all students to enjoy the best resources.

(5) Virtual VR Changes Learning Methods.

VR virtual reality technology has reshaped people's learning methods after multimedia and computer teaching. The use of VR virtual reality technology can also achieve the sharing of educational resources beyond regional and national boundaries [11].

## 5. Conclusion

The development of "artificial intelligence+vocational education" is still in the primary stage of development, which will affect the development direction of vocational education in the future. Under the background of digital age, the integration and sharing of vocational education resources is becoming more and more important. National government departments should take the lead in coordinating the advanced artificial intelligence technology of enterprises. Enterprises and schools should coordinate the personnel training objectives. The continuous integration, innovation and development of "artificial intelligence+education" provide technical support for the sharing of vocational education resources. Based on cloud computing and big data, the existing resources are collected, processed and optimized, and the services of the platform are humanized, systematic and refined by using artificial intelligence technology. The deep needs of users are discovered through machine learning, so that users can get a more perfect experience. The deep integration of artificial intelligence technology and vocational education resources and the creation of sustainable vocational education resources sharing service have gradually become the new requirements of the new era.

## Acknowledgements

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