

# *Analysis of the Characteristics of Modern Industrial Colleges Based on the Perspective of Comparison between China and Foreign Countries*

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**Abstract:** The modern industrial college is a new type of higher education institution in China, following industry-education integration and school-enterprise cooperation in the 21st century. The modern industrial college is distinct not only from practical teaching bases and industry-university-research bases in China, but also from foreign “industrial universities,” “community colleges,” “dual systems,” etc. It possesses the organizational features of “diversified cooperation entities, diverse co-construction models, market-oriented operating mechanisms, and modernized management systems.” Modern industrial colleges are equipped with “problem-oriented, task-driven, and project-based in a real or virtual simulated learning environment” learning features. The modern industrial college is not only an inevitable requirement of the development of new technologies, new industries, and a new economy for colleges and universities, but also an inevitable product of the transformation of knowledge production modes I, II, and III, with the goal of cultivating and meeting the national innovation drive, industrial upgrading, social and economic development, as well as the demand for high-quality compound application-oriented talents.

## 1. Introduction

With the three emerging engineering education construction seminars held in Xiamen, Tianjin, and Beijing in 2017 and the Guangdong University Emerging Engineering and Industrial College Construction Experience Exchange Conference held in Foshan in November, it is evident that the Industrial College has become a research focus for higher education. Prior to 2017, there were fewer than 100 journal articles that matched the theme “Industrial College” in CNKI searches. In the six years from 2017 to 2022, it increased by 40, 64, 89, 285, 496, and 525, respectively. In recent years, “industrial college” has been replaced by “industrialization college”, “industry college”, and “modern industrial college” among others. How is the industrial college distinct from the “college with industry characteristics” introduced in 1950s China? What is the difference between the school-enterprise cooperation model and the 20th-century and 1980s-era contracted training plan and directional training? Among the research contents of this paper will be the identification and evaluation of related concepts. The construction of “industrial colleges” jointly by schools and businesses is not unique to China, as the model of production-education integration has existed for decades in developed nations

such as the United States and Europe. Comparing Chinese and foreign industrial colleges will also be an emphasis of this research. Thirdly, this article will examine, from the standpoint of the transformation of the mode of knowledge production, the reasons for the emergence of the school-enterprise collaborative education model in the mid-20th century, both domestically and internationally.

## **2. Retrospect of Industrial Colleges and Related School-Enterprise Cooperation Models**

In December 2017, the concept of “industry college” was formally proposed in a national document entitled *Opinions on Deepening the Integration of Industry and Education*. Nevertheless, construction of “industrial colleges”, “industry colleges” and school-enterprise cooperation began as early as 2006. The following is a historical overview of the industrial college’s name evolution and construction process.

### **2.1. “Industry Colleges” established by vocational colleges**

Decisions on Vigorously Developing Vocational Education in 2005 and *Opinions on Comprehensively Improving the Teaching Quality of Higher Vocational Education* in 2006 clearly required vocational colleges to “vigorously promote the training mode of work-study combination and school-enterprise cooperation” and “promote the cooperation between public vocational schools and enterprises, thus forming a school-running entity that integrates schools and factories, and schools and enterprises”. The concept of industry college did not exist at that time. Under this guidance, however, numerous higher vocational colleges, particularly in the more economically developed eastern coastal provinces, have established industrial colleges in collaboration with local businesses and industries. In 2006, Zhejiang Technical Institute of Economics partnered with local renowned electromechanical groups and logistics companies to establish the automotive after-sales service industry college and the logistics industry college<sup>[1]</sup>. The most notable and influential case was the cooperation between Zhongshan Polytechnic and leading enterprises in four townships and industry associations in Zhongshan City to establish Shaxi Clothing College, Guzhen Lighting College, South District Elevator College, and Xiaolan Business College in 2011<sup>[2]</sup>. These colleges are referred to as “industry colleges” due to their connections to various local leading industries. They were based on social and market demand, student employment, and career development, with an emphasis on practical ability and vocational skills training, as well as the integration of school and work. This had a significant impact on vocational education at the time.

### **2.2. “Industry College” launched under undergraduate education**

In 2015, *Guidance on Local Ordinary Undergraduate Universities to Transform to Application-Oriented Universities* clearly stated that “we attempt to establish a cooperative school-running and governance mechanism with the participation of schools, local governments, industries, enterprises, and communities; colleges and universities in transition can cooperate with industries and enterprises to form an educational group; it can also jointly build and manage secondary colleges with application-oriented universities”. Obviously, there is no mention of “industrial colleges” or “industry colleges” in the document; however, local colleges and universities in Jiangsu, Zhejiang, and Fujian were attempting to build virtualized “industry colleges” with specific industries and local governments as part of a pilot application-oriented transformation. Changshu Institute of Technology, for instance, has established the first elevator engineering college in China, the first photovoltaic technology college in Jiangsu Province, and the textile and garment engineering college, in addition to the automotive engineering college, the robotics college, the big data college, the tourism college,

etc<sup>[3]</sup>. Zhejiang Shuren University has established “Shanyuhai Business College” and “Shaoxing Yellow Wine College”<sup>[4]</sup>. Apparently, these industry colleges are distinct from the Soviet-inspired industry-specific colleges that China established in the 1950s. Industry-specific colleges are higher education institutions affiliated with the original industry department of the province, city, or district where the school is located, which cultivate specialized talents according to the characteristics of the industry. These institutions include the eight colleges in Beijing, the medical, agricultural, and mechanical colleges affiliated with the local government or local department (bureau), and special industry colleges such as Jingdezhen Ceramic Institute.

### **2.3. “Industrialization College” in the context of emerging engineering education**

In 2017, the “Tianjin University Action”, “Beijing Guide”, and “Industrialization College” were introduced for the first time in official national documents. Universities should “optimize the organizational model of collaborative education within the school, and establish new interdisciplinary institutions, industrialized colleges, etc.” or “promote organizational innovation in universities, and explore the construction of a number of industrialized colleges co-constructed and managed with industry enterprises”. Different objectives and functions characterize the industrialization colleges established by universities. However, from the perspective of university practice, there is no such thing as an “industrialization college”, with “industrial college” or “industry college” being the more appropriate term. Foshan University, a leader in the development of industrial colleges, organized the “Guangdong Province New Engineering and Industrial College Construction Experience Exchange Conference” in November 2017 under the supervision of the Department of Higher Education, the Ministry of Education, and the Department of Education of Guangdong Province. More than 300 individuals from more than 100 colleges and universities, first-class vocational colleges in Guangdong Province, and more than 20 colleges and universities from outside the province attended the seminar, propelling the construction of industrial colleges to a new peak. The Ministry of Education’s Opinions on Deepening the Integration of Industry and Education officially proposed “industry colleges” in December 2017, emphasizing the primary role of enterprises and “encouraging enterprises to rely on or cooperate with vocational schools and institutions to establish industrial colleges and enterprise studios, laboratories, innovation bases, and practice bases”. Later, the same statement was used in Opinions on the Implementation of High-Level Vocational Schools and Professional Construction Plans with Chinese Characteristics and other pertinent documents.

### **2.4. “Contracted training plan” and “order-based training” school-enterprise cooperation**

In domestic colleges and universities, the combination of industry and education and school-enterprise cooperation are not novel. Prior to the 1990s, the talent development model consisted of contracted training and order-based training. The first is that the business entrusts the school with academic training or short-term skills training. The enterprise provides the partner school with the talent information it requires, and the school tailors its professional setting and curriculum to the enterprise’s requirements in order to cultivate the talents it requires. Students can use their vacations to work in businesses, and businesses also send technical talent to schools for instruction. After completing their studies, students enter the workforce. These individuals are referred to as “commissioned trainees”. Order-based training requires both the business and the school to sign a training agreement. When hiring employees, graduates from partner colleges are given preference. When a school conducts instruction, training should be tailored to the needs of the enterprise, as the enterprise will establish talent standards. Students who are instructed in accordance with the standards are referred to as “directed students”. These two training methods have obvious advantages, in that they can meet the enterprise’s talent requirements, thereby significantly reducing the frequency of

personnel turnover and the losses caused by personnel turnover and saving the enterprise's human and material resources invested in recruiting, retaining, and training personnel. With the implementation of a single enrollment plan, unified admission standards, and the cancellation and replacement of work package assignments with independent career selection, the contracted training plan and order-based training were gradually forgotten.

The majority of industrial college construction has switched from vocational colleges to universities during the past decade, based on the pattern of building industrial colleges<sup>[5]</sup>. Currently, “industrial colleges” or “industry colleges” differ significantly from general industry-university-research platforms, college students' practical teaching bases, and industry-specific schools. They are “institutions that combine resources, funding, platforms, bases, and talent from colleges and industries, businesses, local governments, and other companies or groups. With industry-specific personnel training, corporate employee training, technology research and development, cultural inheritance, etc., as their shared objective, they are expected to be second-level colleges with industry and cooperative elements”<sup>[6]</sup>.

### **3. Comparison of foreign industry-education integration models**

The model of school-enterprise cooperation, industry-education integration, and collaborative education is neither the first model of higher education in the world nor the exclusive one for China, as there are numerous models abroad with similar characteristics. In essence, it is more comparable to the “dual system” and “industry-academia cooperation” talent training models of Germany and South Korea, respectively.

#### **3.1. University for Industry in the UK**

Some commentators believe that China's “industrial college” can be traced back to the British Ministry of Education and Employment's 1998 planning and 2000 implementation of the “University for Industry”. Although the names are somewhat similar, their essences are distinct. Universities for the industry are not universities but rather open distance learning organizations with an intermediary nature. Its primary service demographics are adults and professionals. Its primary objective is to provide high-quality, efficient, and personalized learning platforms and courses through information and communication technologies. The primary objective is to stimulate the needs of businesses and individuals for lifelong learning and to improve the competitiveness of British businesses (especially SMEs) and the employability of the workforce, thereby rendering the United Kingdom invincible in the increasingly fierce global economic competition<sup>[7]</sup>.

#### **3.2. Community Colleges in the United States**

When comparing industrial colleges to community colleges in the United States, there is a significant difference. Community colleges in the United States exist to provide ordinary people with educational opportunities. This education is non-academic in nature. The majority of students are adults, including many senior citizens. The entry bar is low, and the application process is straightforward. The majority of the courses are career-focused or general education courses that help students transfer to universities in the future. However, the cooperation between American universities and businesses is still very extensive and in-depth, particularly for the employment of students, as schools frequently hire experts to dissect each position, formulate reasonable teaching objectives, and assist them in carrying out instruction and training in accordance with enterprise requirements. The company will provide positions, compensation, and dispatch managers to assist with the safe operation of students according to the school's needs. The school will also assign

teachers to oversee and direct students' work and study, thereby gaining a better understanding of their progress<sup>[8]</sup>.

### **3.3. Germany's "Duale System" (Duales Studium Ausbildung)**

Numerous commentators believe that the current industrial colleges in China closely resemble the German "dual system" education model<sup>[9]</sup>. German and European vocational education is characterized by a "dual system", in which public vocational schools are one part of the system and off-campus practice sites, such as businesses or public institutions, are another. This is a talent development model dominated by social enterprises, with vocational colleges serving and cooperating solely with businesses. On-campus instruction emphasizes the integration of theory and practice and is based on the training of students' fundamental skills; enterprises primarily use on-site instruction, such as industrial teaching training in the workshop, technical training in the production room, traditional handicraft training, system training in the service industry and office, etc. The company employs students as apprentices and enters into training agreements with them. After completing the training, students can obtain the corresponding certificate of vocational training and find employment.

### **3.4. "Industry-University Cooperation" talent training model in South Korea and Japan**

In South Korea, the relationship between vocational education and businesses is also very close. Numerous new forms of industry-university cooperative education have emerged, including the "2+1" and "customized education" models. The school-enterprise cooperation conducted with a focus on cultivating qualified employees involves the college viewing businesses as customers, cooperating with businesses in human and material resources, transforming the educational environment, and cultivating talents according to the number, specifications, and specific professional lengths of manpower required by businesses. Additionally, the government guides and promotes the policy<sup>[10]</sup>. For school-enterprise cooperation, numerous schools in Japan outsource a portion of their curriculum to cooperative enterprises. When students study, they go directly to the training bases of businesses for hands-on instruction, and the completion of these outsourcing courses will be reflected on their transcripts. The course is applicable and beneficial to industry and academia. It is conducive to students obtaining the "National Technical Qualification Certificate" and focuses on enhancing the efficiency of experiments and fieldwork.

## **4. The background of the industry-education integration and the characteristics of industrial colleges<sup>2</sup>**

Why are school-business partnerships and industry-education so strongly promoted in colleges and universities? How do we collectively build an industrial college? Different theorists have distinct points of view and conclusions. Some use the theory of new institutional economics to investigate the preconditions and driving factors of industrial colleges' rapid development<sup>[11]</sup>. Some research on the logical structure of organizational change, organizational characteristics, and reform trends concludes that industrial colleges are the innovation of science and engineering colleges<sup>[12]</sup>. Some examine the formation logic of mixed-ownership industrial colleges from the four-fold perspective of industry, learners, vocational education, and institutional reform<sup>[13]</sup>. Some use the field theory of French sociologist Pierre Bourdieu to analyze the current state of modern industrial college construction in China<sup>[14]</sup>. Industrial colleges are not only the unavoidable prerequisites for colleges and universities to develop new technologies, new industries, and a new economy, but they are also the unavoidable result of the transformation of knowledge production mode I, mode II, and mode III.



#### 4.1. Challenges brought by the transformation of knowledge production mode to universities

In a sense, the process of human society's development is the process of the constant innovation of knowledge. The iterative update cycle of knowledge has become shorter as a result of the four industrial revolutions, and the innovation speed of the knowledge production mode will increase. Prior to the middle of the 20th century, no institution could compete with universities in terms of new knowledge production. However, in the 21st century, universities are no longer the monopoly of knowledge production, and non-university institutions (including leading corporations, research institutes, governments, and think tanks, as well as individuals) are beginning to participate in the knowledge production process. After entering the information age or intelligent age, the transmission, production, and application of knowledge have fundamentally shifted from academic elites to other members of the production practice, from universities, classrooms, and laboratories to communities, workshops, and research facilities. The image of higher education institutions as "ivory towers" and the "dominant" status of the academic elite. The most up-to-date technology, the best facilities and equipment, and the most advanced laboratories are not always found in universities, particularly in large enterprises, leading enterprises, and new-type enterprises, whose technical level, equipment, and facilities are frequently far ahead. high school level. McDonald's Hamburg University, Motorola University, Siemens University, HP Business School, Panasonic University, Taiwan's Acer Aspire Academy, China's Haier University, etc. are just a few examples of companies that have begun establishing their own universities. In light of this, M. Gibbons and others first proposed knowledge production mode I and mode II in the early 1990s<sup>[15]</sup>. After the turn of the 21st century, Elias G. Carayannis et al. proposed the third mode of knowledge production<sup>[16]</sup>.

Mode I is a single-disciplinary model emphasizing knowledge inheritance and scientific study, and knowledge is in a point-like, linear state; Mode II is a cross-disciplinary model emphasizing a "problem-oriented" approach. Disciplinary knowledge production mode, emphasizing knowledge application and serving society, with knowledge in a non-linear intersection state; Mode III is a transdisciplinary production mode characterized by "knowledge clusters," emphasizing knowledge innovation and multi-integration, and displaying a multi-dimensional network knowledge cluster state. In the dimensions of knowledge production context, knowledge production personnel, knowledge production nature, production basis, production results, and quality control methods, the three models exhibit distinct characteristics such as innovation and multi-participation, with other characteristics becoming increasingly apparent<sup>[17]</sup>.

#### 4.2. Industrial colleges are an inevitable choice for universities to cope with the transformation

Industrial colleges constitute a new form of higher education institution that arose in China as a result of the integration of production and education and the intensification of school-business collaboration. From the standpoint of internal development momentum, it relates to the change in knowledge production organization and the trend of discipline knowledge structure development. The history of construction and cultural precipitation is related to the application and promotion of new technologies in the field of education and teaching; from the perspective of external factors, they are related to the demand for higher education in social and economic development and industrial structure adjustment, as well as the development of new formats and new technologies. Application is important to innovation<sup>[18]</sup>. According to the author, the current "industrial college" is a paradigm of industry-education integration and school-business cooperation. It is a partnership between educational institutions and social capital or resources (including local governments, leading enterprises, industrial parks, industry alliances, etc.). Educational institutions have the organizational characteristics of "diversified cooperation subjects, diversified co-construction models, market-oriented operating mechanisms, and modernized management systems"; They do not take profit as their starting point, but rather aim to cultivate high-quality scientific and technological talent and have

goal orientation to meet the national innovation drive, industrial transformation and upgrading, and the transformation and development of society.

The publication of the Guidelines for the Construction of Modern Industrial Colleges in 2020 and the selection of 50 national-level modern industrial colleges in 2021 are the country's comprehensive summary of the construction practice of industrial colleges in colleges and universities for more than a decade, confirming the collaborative education model in its entirety. It also indicates how application-focused institutions might construct contemporary industrial colleges.

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## References

- [1] Xu Q.E. *Industry College: Effective Exploration of the Implementation of Work-Study Combination in Higher Vocational Colleges* [J]. *China higher education research*, 2017,(10):72-73.
- [2] Zheng Q. *Industrial College: Higher Vocational Education Mode Oriented towards Industrial Cluster —Based on the Analysis of Industrial College of Zhongshan Vocational and Technical College* [J]. *Vocational and Technical Education*, 2013,34(35):55-58.
- [3] Zhu S.Z. *Mechanism and Model Innovation of Applied Undergraduate Talent Training—Taking the Exploration of the Industry College of Changshu Institute of Technology as an Example* [J]. *Jiangsu Higher Education*,2016,(5):83.
- [4] Pan M.Y. *On the Return and Development of Colleges and Universities with Industry Characteristics* [M]. *Chongqing Higher Education Research*, 2017:216
- [5] Liu X.P., Xiao J. *Exploration of the construction course and main problems of industrial colleges in local universities* [J]. *Journal of Foshan University (Natural Sciences Edition)*.2020(5):48-52
- [6] Li B.Y., Tang F.L., Zheng X. M. *Functional Design and Operation Mode of Industrial College* [J]. *Education Review*, 2015, (11): 3-6.
- [7] Hong M. *University for Industry in the UK and Learning Society* [J]. *Open Education Research*, 2001(1):43-45.
- [8] Zhang N. *Research on the Characteristics of University for Industry in the UK* [D]. Beijing: Minzu University of China, 2008.
- [9] Tian Y.M. *Comparative analysis of typical foreign school-enterprise cooperation models* [J]. *China Training*, 2008,(10): 54-55.
- [10] Shao Q.X. *Study on Theory and Practice of School-running Mode of Industrial Colleges with Chinese Characteristics* [J]. *Vocational and Technical Education*, 2009,30(4):44-47.
- [11] Liu Y.F. *Research on talent training mode under the background of industrial colleges* [J]. *Adult Education*. 2010(3):56-57.
- [12] Li X.J. *On the Institutional Logic and Policy Implications about Industrial Colleges* [J]. *Vocational and Technical Education*. 2015, 36(31):49-52.
- [13] Hu W.L. *The Logic of the Organizational System Innovation in Industry College: In the Perspective of Three Chain Integration* [J]. *Research in Higher Education of Engineering*, 2018(3):13-17.
- [14] Huang W.W., Guo J.Y., Wang B. *The Generation Logic and Institutional Construction of Mixed Ownership Industrial College* [J]. *Vocational and Technical Education*, 2019, 40(13):35-39.
- [15] Qiu F., Qian G.H. *On the Realistic Predicament and Breakthrough of Modern Industrial Colleges Construction from the Perspective of Field Theory* [J]. *Application-Oriented Higher Education Research*. 2022, 7(2):28-34.
- [16] M. Gibbons, C. Limoges, H. Nowotny, Translated by Chen H.J., Shen W.Q. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* [M]. Beijing: Peking University Press, 2011.
- [17] ELIAS G. Carayannis, DAVID F. J. Campbell. *Mode 3 and Quadruple Helix: Toward 21st Fractal Innovation Ecosystem* [J].*International Journal of Technology Management*, 2009, 46(3):201-234.
- [18] Du Y.F., Yu X.Y. *Reform of University Scientific Research Evaluation under the Background of Knowledge Production Mode Transformation* [J]. *Higher Education Development and Evaluation*. 2022, 38(04):1-8.
- [19] Liu G.M., Jiang Z., Li N. *On Development Characteristics and Change Path of Modern Industrial Colleges from Organizational Innovation Perspective —Case Studies of First Modern Industrial Colleges* [J]. *Research in Higher Education of Engineering*, 2022,(5):80-86.