

The Value of Collaborative Education in Industry-Specific Colleges and Universities of China: Tracing the Origin, Travails and Iterations

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Abstract

Collaborative education is a key support for modern higher education to cultivate innovative talents, and it is also an important frontier of structural reform on the supply side of talents in industry-specific colleges and universities. However, the value-level analysis and attribution have been weakly considered. Targeting the value divergence, demand value transference and evaluation misplace, it is urgent for industry-specific colleges and universities to scrutinize the whole collaborative education system by tracing the origin and iterations. The implementation of high-quality and characterized strategies for the development of higher education in the new era could only be achieved by exploring the unity of values, allocation of resources, integration and innovation interaction and reconstruction of evaluation.

Keywords

Value, Collaborative Education, Industry-Specific Colleges and Universities

1. Introduction

Collaborative education refers to deepening the integration of production and education through the government, enterprise support, university docking, co-construction and sharing, promoting the organic connection of the education chain, talent chain with the industrial chain and innovation chain, and promoting the reform of talent training in colleges and universities with the latest needs of industrial and technological development. Science and education are vital components to a strong nation and a strong nation of talents. The innovation calls

for innovative talents from all walks of life. Compared with other talent cultivation modes, collaborative education possesses the merits of being close to the industrial chain and cultivating diversified subjects, which is highly compatible with the requirements of high-quality economic development and meets the multiple expectations of talent supply-side reform. The reform demand is especially urgent because industry-specific colleges and universities are the critical combination of the first productivity of industry science and technology, the first resource of industry talents and the first driving force of innovation. However, the previous research on collaborative education reform has focused more on the themes of professional teaching, model mechanism and platform construction, and scarcely touches the unity of value. Nowadays, social organization patterns and value demands, including modern industrial system and higher education, have changed profoundly, and the unity of values among multiple subjects will inevitably affect the stability and sustainability of collaborative behavior, which in turn affects the quality of talent cultivation and reform effectiveness.

This paper tries to clarify the value axis, the root causes of value, the real-life travails as well as the focus of the collaborative value by tracing the history of collaborative education in colleges and universities with industrial characteristics. Finally, this paper aims to provide new ideas for industry-specific colleges and universities in dealing with the confusion in the process of collaborative innovation talent training on reflection of the value system reform.

2. Results and Discussion

2.1. Evolution of the Value of Collaborative Education in Industry-Specific Colleges and Universities

Industry-specific colleges and universities refer to the single-subject colleges and universities formerly affiliated with a ministry of the State Council of China, which have the discipline characteristics of close link with the industry and significant industry-specific characteristics (Wang, 2009). In particular, through mutual cooperation and communication in teaching resources available from each party and giving full play to their respective advantages with collaborating companies and institutions, they strive to cultivate high-level professionals who can adapt to and meet the needs of economic and social development, and play an irreplaceable role in leading the development of industry, promoting scientific and technological progress and serving the society and economy.

Combing with the milestones of value orientation, its history can be divided into four stages: The Early Stage-Extension Stage-Transformation Stage-Quality Improvement Stage.

1) The early stage (1952-1983): “to serve production and construction” was the platform, and the value of collaborative education emphasized satisfying needs, highlighting instrumental rationality and concealing value rationality

From the second half of 1952, in order to meet the needs of early socialist construction and influenced by the Soviet Union’s professional education, China

started to set up colleges and universities with industrial characteristics by separating or merging and reorganizing colleges and universities from comprehensive university departments. It involved agriculture, forestry, geology and mining, iron and steel metallurgy, petroleum and chemical industry, medicine and healthcare, water conservancy and electricity, construction and transportation, electronics and communication, media and language, etc. (Cao, 2020). In order to achieve the goal of making the “original departments” more precise and deeper, these colleges and universities were further divided into different sections and departments. At the same time, in response to the Ministry of Education’s instruction “Education must be combined with production work “ in 1995, industrial colleges and universities actively went out of the “ivory tower”, strengthened the construction of off-campus cooperation bases represented by farms, factories and mines, and established the early model of “half-work, half-study, work-study combination”. “At this stage, the industry-specific colleges and universities developed an initial model of collaborative education. Although the breeding of industry-specific colleges and universities had a late start. The demand for collaborative education was strong, fast and tightly combined, and the value logic naturally overlapped with the macro construction needs, but obviously came from the authority and was forceable, which inhibited the internal drive of each subject of collaborative behavior to self-construct (Yuan, 2018).

2) Extension Stage (1984-1994): Taking “reform of science and education system” as a channel, the value of collaborative education was expanded and generalized, advocating multi-directional layout such as academic level and two-way transportation.

In the early 80s, under the influence of the theory of “Science and technology is the first productive force” proposed by Mr. Deng Xiaoping and the reform of education system as well as science and technology system, the engineering colleges and universities represented by the East China Institute of Technology took the lead in breaking the boundary between scientific research and education system to cultivate talents, and provided “joint cultivation of schools and institutes” and “commissioned cultivation” to graduate students and in-service employees with the institutes affiliated to Chinese Academy of Sciences (Graduate School of East China Institute of Technology, 1985); Subsequently, some universities with industrial characteristics seized the opportunity to try to collaborate not only with industry, but also with the policy and supply system. For example, the Ministry of Education approved 24 colleges and universities to build engineering master practice bases with enterprises and explicitly proposed to establish “Double-tutor system” (1985); the State Council firstly expressed “Combining industry and education” in the Decision on Vigorously Developing Vocational and Technical Education (1991); the State Economic and Trade Office, the State Education Commission and the Chinese Academy of Sciences jointly launched the “Joint development project of industry-university-research” (1992). Through this round of science-education linkage, the collaborative education of

universities with industrial characteristics had been extended in many directions, such as academic level, cultivation form and operation mechanism, with the tendency of returning to the academic research background and the value demand tending to “advocate scientific research and complementary advantages”. The phenomenon of disconnection between the original value focus and the industrial front line was gradually emerging.

3) Transition Stage (1995-2011): With “dilution of industry-run schools” as the variable, the value of collaborative education was affected by deflation and alienation, and there was a tendency of dispersion of goals and homogenization of some transmutations.

Around the new century, the economic construction driven by scientific and technological progress had become the basis of the times. In the background of the strategy of “developing the country through science and education”, “Project 211” and “Project 985” were launched successively, which means that a new round of reform of higher education management system was started. As a result, many colleges and universities with industrial characteristics, such as China Pharmaceutical University, had been directly managed by the Ministry of Education or transferred to localities, which had led to a looser connection with industrial ministries and a gradual disintegration of the original school system. The overall development and collaborative education of the university faced a new choice of transformation. In addition, in the face of “Qian Xuesen’s Question”, the “National Base for Training Talents in Basic Research and Teaching in Science” (1996), “National Base for Training Talents in Life Science and Technology” (2002) and the “Excellent Engineer Education and Training Program” (2010) established in succession. It achieved the consensus of multiple subjects from “government, industry, academia and research” to vigorously cultivate basic research and high-end technical talents. Under the impact of the superposition of compound variables, some universities with industrial characteristics turned to follow the development logic of comprehensive and academic universities, and the value concept and management of collaborative education also change. For example, the selection of off-campus cooperation bases was blindly set up following the trend of “Seeking for greater, much and all-inclusive”, and the superficiality of value identity and homogenization of cultivation paths due to the pile of license and repeated construction were pretty common, which indirectly weakened the discourse of universities in pursuing education goals in the operation process (He, 2020).

4) Quality Improvement Stage (2012-present): Taking “collaborative innovation” as an opportunity, the value of collaborative education has a “resonance effect” and enters the track of independent return and upgrade.

Since the 18th Party Congress, the country’s economic development has gradually changed from scale expansion to high-quality development. The Internet wave has swept through thousands of industries in China, and the innovation and proliferation of modern industrial technology has prompted frequent side-

effects at the higher education end, especially in industry-specific colleges and universities. Northwest Agriculture and Forestry University of Science and Technology, for instance, and a number of industry-specific universities have taken the initiative to figure out the changes and adapt to them, using scientific research cooperation projects as a carrier for collaborative education (Li, 2015). Seeking resonance in the process of “re-industrialization”, they jointly constructed the base of innovation and practice to carry out in-depth collaboration, and finally became the main force of the first batch of national modern industrial colleges. At the same time, governments at all levels have implemented the reform of decentralization and management, getting rid of the overly practical and detailed management role, and shifting to the top-level design or building a comprehensive integration platform of synergistic elements. In parallel, other bodies rely on collaborative education to explore knowledge innovation, cross-innovation and original innovation. Among them, the Ministry of Education’s Industry-University Cooperation Collaborative Education Platform is a classic example. In the past eight years, more than 1100 undergraduate colleges and universities and more than 1100 enterprises have registered on this platform, with 76,000 cooperative projects and more than 2.7 billion yuan of investment. Fruitful results and positive feedback from all walks of life are obtained (Ministry of Education of the People’s Republic of China). From this point of view, the new concept and new economy not only accelerate the reconstruction of the industrial model, but also reshape the concept of higher education, leading to a qualitative upgrade of the value of collaborative education, switching from “Policy-led, Management-driven” to “Ontology-led, Innovation-driven”, and choosing the path of characteristic connotation development that fits the construction of “Double first-class” and “Four New” disciplines.

2.2. Analysis on the Value of Collaborative Education in Industry-Specific Colleges and Universities

From the historical perspective, industry-specific colleges and universities have distinctive and differentiated educational functions, and hold different values from other value perceptions in the collaborative education mode, and have more industry perspective construction power. Therefore, multiple dimensions can be selected to interpret the value of characteristics.

1) The contract value of optimizing the quality structure of the industry workforce

The so-called contract is the unanimous will to maintain and restrain the contracting behavior from the intersection of interests, which can be both in the form of an instrument and a convention-type consensus. As an institutionalized arrangement originated from the national construction needs, universities with industrial characteristics are historically endowed to run schools for the industry, and conduct contractual mission to the government and society, and are regarded as a strategic base for cultivating high-level industrial talents. The continuous supply of professional quality human resources is the specific action to

fulfill the contract, and collaborative education is the derivative mode to realize the value of the contract. From the above history, its evolution always moves ahead with the development of major strategies, industry changes, education management systems and other policy systems. This has led to the conscious recognition of the rationality and legitimacy of collaborative behavior by participants and related parties both inside and outside the field, and a broad cognitive understanding of the value of the contract.

2) The value of exploration in response to the reform and sustainable development of higher education

The changes of the times have given rise to educational trends, which in turn drive the scale, type and connotation of higher education at home and abroad to change and explore in practice. In China's higher education system, colleges and universities with industry characteristics have a functional status that cannot be ignored because of their industry relevance and influence, especially in the development of classification and characteristics, and they have been given the identity of explorers of the transformation from "The Pyramid" to "The Five-finger Mountain" (Du, 2020). The teaching mode and knowledge composition are different from the conventional teaching paradigm, focusing on the changes of industry economic cycles and industrial technology iterations, paying special attention to the practical application properties and ability enhancement of the education system, treating the practical teaching process as a process of digesting theory, strengthening theory, expanding theory and refining skills. It emphasizes the organic connection between education chain, talent chain, industry chain and innovation chain altogether (Pan & Che, 2008). Therefore, its progress is not only helpful to explore the path of "combining science and practice" and "cross-fertilization", but also has the potential value of promoting the high-level construction of universities with industrial characteristics.

3) Promote the value of co-creation of mutual promotion and mutual benefit of multiple subjects in the industry field

Based on the advantage of mutual track with industry, the resources, talents and technologies of industry-specific universities are basically circulated within a specific system. Even if a management change occurs, the relationship with the industry research base and the former competent ministries and commissions still exists (Qi & Zhou, 2014). Relying on the inertia of co-operative education, universities not only benefit directly from student cultivation, but also receive support and benefits from other co-operative entities in terms of "Dual-mentor and Dual-capacity" teacher cultivation and directional discipline construction; correspondingly, many non-university entities have gained various benefits in terms of talent attraction, technological innovation and achievement transformation at the same time. In the same period, many non-university subjects have gained various benefits in recruiting talents, technological innovation and transformation of achievements, which have opened up external resources to improve their own strength. Therefore, the collaborating parties are not only the partici-

pants of specific education mode and the inheritors of knowledge and skills, but also the collaborators of industry innovation and the sharers of practical achievements. For this reason, the terms “mutual promotion, mutual benefit, win-win, and sharing” appear frequently in the research literature of collaborative education, which also confirm the existence of the value of co-creation.

4) To confirm the practical value of “nurturing” as the inner unified “center of gravity”

Education is a critical national plan, with priority development and long-term significance. In the process of uniting education, only when social subjects truly participate in the process of talent cultivation and understand the conflict between their own interests and education concerns, can they take the lead in understanding the meaning of education, promoting consensus on cooperation and building a synergistic state. In this regard, the collaborative subjects of industry-specific colleges and universities are more embedded, more willing to participate. They share talent dividends more directly, and have more credible value in education experience. On the superficially, through repeated practice, the obvious value axis of collaborative behavior is to serve the major national strategies in specific macro backgrounds. However, if we look at the changing times of the economy and society, the themes of collaboration vary, but “people-oriented” always continues. Once the core essence of cultivating talents is removed, short-term conflicts of interest and games will arise, destroying the foundation of collaborative cooperation, contractual payment, education reform implementation, or co-creation and sharing. And these could never be realized. Therefore, the practice of industry collaboration further proves that the core of nurturing talents should put as the center, which is the sole element constituting the inner unity of multidimensional values.

2.3. The Realistic Dilemma and Value Interpretation of Collaborative Education for Industry-Specific Colleges and Universities

Nowadays, from the initial school-factory (enterprise) cooperation, new forms such as cross-regional joint training, science-education cooperation and school-location cooperation have been derived, from the dual body of industry and education, multiple bodies such as “Government, industry, study, research and application” have been developed. And “The double tutor system” and “Project platform system” have been catalyzed from the workplace practice and entrusted training.

Although the initiatives are constantly being introduced, the current situation of collaborative education in universities with industrial characteristics is not lacking in “emphasizing resource sharing but not sharing education”, “shadowing of base construction”, “fragmentation” of students’ ability cultivation, “fragmentation” of professional knowledge mapping, etc. The current situation of collaborative education in colleges and universities with industry characteristics has received widespread criticism (Lin, 2019). These lead to the poor effective-

ness of the initial reform. Deconstructing from the value perspective, “The three major value paradoxes” are the root causes of the failure of synergy.

1) The deviation of “Collaborative trade-off” and “Contractual value”

The initial motivation for multiple subjects to participate in collaborative education varies, and the value pursuit that should be attributed to “nurturing talents” is often alienated based on the interests of the parties themselves. On the one hand, due to the limitation of jobs or instructing power, it is difficult for a single industrial partner to receive students on a large scale, so the synergy benefit of participating in talent training will not be significant in the short term. Again, it may even bring pressure on production tasks due to manpower deployment. On the other hand, the professional knowledge of students from industry-specific colleges and universities is in line with the high adaptability of practical positions, so the synergy value is more easily transformed into economic value. In the end, industrial subjects are easy to carry out training according to their own immediate needs, even if there is a possibility of violating the basic task of collaborative education and forming the inertia of deviating from the value focus of “education”. By the same token, the government and other curators of collaborative behavior are inevitably exposed to value conflicts due to short-term interests or pressure. In view of this, the unity of values highly affects the achievement of professional quality human resources goals.

2) The deviation of “industrial demands” and “exploration value”

Supply and demand are the two sides of higher education, reflecting public service attributes. After the students of industry-specific colleges and universities enter into the collaborative process, the knowledge supply system of the main body outside the university and the demand for talent cultivation form the value matching relationship in the collaborative education field, and the education mode, similar to “The double tutor system” and “The project cooperation system”, is selected through the value balance. However, due to the interests of the industrial entities, the value balance of the model is not enough. Considering the interests of industrial subjects and the continuity of cooperation, universities often adjust the original teaching mode according to the changes of industrial organization and division of labor, giving up the essential demand of education to the supply demand of industry, which makes collaborative education become an accessory or dependent form of the big proposition of industry-education integration (Chen & Zhang, 2017). However, the characteristics of industrial projects, such as stage examination and judgment, commercial operation cycle and result-oriented evaluation, are not in line with the “Thick foundation and broad caliber” of the “Through-education” model. Still, the industrial projects are characterized by stage examination and judgment, commercial operation cycle, result-oriented evaluation, etc., which do not meet the requirements of “Thick foundation and wide caliber”, the characteristics of coherent academic logic and long-cycle scientific research thinking, not to mention academic analysis, research criticism and cross-disciplinary integration. Therefore, when exploring talent

cultivation, universities with industrial characteristics need to keep their role as leaders and reset their values, and should not be overly oriented to “Pure industry orientation”.

3) The deviation of “evaluation dimension” and the “education value”

Most of the off-campus mentors of industry-specific colleges and universities have experience in the frontline of industry, and they have practical experience and professional sensitivity to industrial changes such as new industry, new equipment and new skills, and their instructive attitude and teaching standard awareness at the implementation level are crucial to the effectiveness of collaborative education. However, for a long time, both colleges and universities and collaborative subjects have been using their own performance evaluation indexes for this group, and lacking the evaluation of the value of education, resulting in the merits of guidance work relying more on personal responsibility and the negative participation of some high-quality teachers due to the inadequacy of related mechanisms, which makes not only the common phenomenon, i.e., the mixed feedback of students’ academic performance, but also the emergence of collaborative teaching organizations. The tendency of “loosening” of the co-teaching organization has further aggravated the deviation of contract value, exploration value and co-creation value.

2.4. Suggestions for the Iteration of Collaborative Education of Industry-Specific Colleges and Universities Based on the Value Orientation of Education

Faced with the multiple iterations of national strategy with a deeper adjustment, industry quality upgrading and higher education deepening reform, the collaborative education of industry-specific colleges and universities has reached a crossroads. As an important means to promote the deeper integration of industry and education, it is necessary to respond to the realistic dilemma in the cultivation of talents in the new era in order to meet the proposition of high-quality development.

1) To establish unified values with talent value as the core

It is true, as the American educator Abraham Flexner put: the university should from time to time meet the needs of society, not its desires (Abraham, 2001). Although changes in social needs are important variables for industry-specific universities to perform their educational functions, and elements such as the laws of industrial and economic development, policy guidance, and industry volatility impact the logic of collaborative education operation to varying degrees, urging the reform of this type of higher education to eagerly break through traditional teaching concepts. Whereas high-level education has deep sociological and pedagogical roots, and needs to reflect the changing characteristics or connotations of the times. Even should be moderately ahead of the economic and social development (Duan & Lu, 2022).

Universities are located at the front end of the talent ecological chain while satisfying the immediate needs of high-quality talent supply in modern society,

they should adhere to the principles of teaching essence and design, and deeply recognize that the teaching essence is the precursor of all educational activities and behaviors (Liu, 2020), talent cultivation is always the starting point of collaborative education and the landing point of the teaching essence. Therefore, in the process of promoting industrial self-sufficiency and realizing the dream of a strong nation, universities with industrial characteristics should shoulder the main responsibility of promoting unified cognition, guiding diversified subjects to thoroughly understand the value of collaborative education, agreeing that “Production is the support and teaching is the core” (Tang et al., 2018), and highlighting the long-term value of collaborative cultivation of high-quality talents in various forms. We will continue to deepen the collective value of collaborative subjects to ensure the core position of nurturing value in the process of cooperation, and make it a prerequisite logic to realize the standardization of teaching, uniform quality and rationalization of performance evaluation.

2) To set up an industry base selection mechanism based on the standard of value adaptation

The construction of resources represented by off-campus bases is the substantial carrier to carry the goal of collaborative cultivation of high-level talents in the industry. Within the higher education system, industry-specific colleges and universities are different from comprehensive universities and higher vocational colleges and universities, and have the advantages of resources such as convenient industry docking, dense alumni distribution and strong tendency to combine industry and education, which make it easy to build a systematic system of collaborative education bases. Nevertheless, there are differences in the scale of professional students, the ratio of undergraduate and graduate students among universities; the structure of industry and research, the level of employees, the strength of guidance, the management structure and other conditions of each collaborative body also determine the different needs for the types of collaborative training students and the degree of response to the collaborative mechanism... In addition, in order to avoid the formalization and bias of “educating focus”, universities with industrial characteristics should not merely follow the “Industry Ranking List” or follow the construction path of other universities in the construction of collaborative education resources, but should sort out the list of entities according to their own reality and classified development orientation. When examining the external subjects of collaborative education, we should pay attention to the suitability of the selection criteria, especially the value concept fit, and reasonably plan the layout of school-industry collaboration, school-science collaboration, and school-school (international) collaboration, and develop the operation management, teaching management, resource management and other targeted indicators based on the value axis of educating people, so as to guarantee the effectiveness and stability of the collaborative education organization, embed the value of educating people in the industry chain and demand chain pragmatically, and make joint efforts to create a characteristic collaborative chain.

3) To promote the value of interaction with collaborative education as the fulcrum

From the analysis of stakeholder theory, the effective constraint of unified values of collaborative education needs to be supported by the substantial interests generated by the co-creation and interaction among multiple subjects. In the era of openness, cooperation and expansion, facing the new trend of expanding and integrating new industries and disciplines such as big data and artificial intelligence, macro development and industry progress are all hoping to have a reserve of multi-talented and innovative talents. The collaborative education in the industrial field should not be confined to the inertia restriction of discipline specialization and industrial knowledge boundary, otherwise it will only forge the extended and high imitation version of the previous professional talent training mode. We try to introduce cross-border educational resources from other advanced disciplines, promote interactive value co-creation, develop matrix-type project clusters, cultivate and refine project sequences based on educational objectives and academic requirements, and increase resource advantages to talent advantages, and rely on talents to feed the industry.

At the same time, with the advantages of discipline characteristics, specialized talent gathering and skill inheritance, we focus on national major basic research directions, industry key common technical problems, major original achievements and discipline frontier breakthroughs, continuously increase high-level research in the way of industry-education integration and science-education integration, rely on the depth and breadth of the actual value, seek to release cooperative kinetic energy and coordinated development of individual education, and promote the continuing effect.

4) To reconstruct the collaborative guidance evaluation reform with the effectiveness of education as the origin

Objective evaluation feedback is the basis for continuous improvement of higher education quality, and it is also a guide for industry-based collaborative education to clarify problems, improve content and adjust educational strategies. Nevertheless, its evaluation objectives and forms are different from traditional evaluation systems, most of which are placed in real application scenarios and have prominent practical teaching attributes, so it is worthwhile to achieve new empowerment of collaborative evaluation systems through the construction of categorized indicators and formative evaluation.

First, from the perspective of educating people, knowledge output and ability verification should be emphasized, and collaborative instructional evaluation based on “Practical participation, knowledge empowerment, and student recognition” should also be carried out, examining the frontiers and principles of instructional content, the rationality and interactivity of teaching forms, and the coherence and inquiry of learning effectiveness.

Secondly, the combination of formative evaluation and summative evaluation reflects the shift from the achievement of “Quantity” to the pursuit of “Quality”.

For industry-specific colleges and universities, based on the classification index of collaborative education and “The New Infrastructure” dividend of higher education in the post-epidemic era, we can realize the data, visualization and precision of collaborative guidance performance, implement the construction of collaborative bases and the dynamic adjustment mechanism of internal and external instructors by using the technical means of quality evaluation, and respond to the construction of resource adaptation. In addition, a new paradigm of teaching quality assurance would also be set up.

3. Conclusion

This study traces the history of collaborative education in colleges and universities with industrial characteristics, elucidates the value axis, the root causes of value, the real-life travails and the focus of collaborative value, and provides new ideas to deal with the confusion in the process of collaborative innovation talent training on reflection of the value system reform for industry-specific colleges and universities.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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