

# The Value Connotation, Operation Mechanism, and Promotion Path of the "School-Enterprise Ecosystem" in Private Schools from the Perspective of Symbiotic Theory

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**Keywords:** School-Enterprise Ecosystem, Symbiotic Unit, Symbiotic Mode, Symbiotic Environment

**Abstract:** The "School-Enterprise Ecosystem" is a new paradigm of harmonious coexistence and collaborative education and industry integration based on symbiotic theory. The symbiotic theory originated in biology, and its core idea is the relationship between different species achieving mutual benefits through interaction, which is in line with the connotation of the "School-Enterprise Ecosystem". From the perspective of symbiotic theory, the operation mechanism of the "School-Enterprise Ecosystem" includes the interaction mechanism of symbiotic units, the construction mechanism of symbiotic modes, and the strengthening mechanism of the symbiotic environment. The promotion path for the construction of the "School-Enterprise Ecosystem" is the symbiotic integration of multiple teaching and service coexistences through the "integration-symmetry-reciprocity" principle. By promoting the generation and transmission of energy in the "School-Enterprise Ecosystem", achieving the sharing of achievements, and creating a good symbiotic environment, the construction of the "School-Enterprise Ecosystem" can be promoted.

## 1. The presentation of the problem

In the face of global competition and challenges, "Made in China 2025" is an important path to realizing the dream of a strong country. On this road, there is a need for a high-quality talent team that can adapt to industrial transformation and upgrading. And the construction of this team depends on the development of applied undergraduate education. In 2017, the General Office of the State Council issued "Several Opinions on Deepening the Integration of Industry and Education", which aims to promote the organic connection of the education chain, talent chain, industry chain, and innovation chain <sup>[1]</sup>. In 2018, the Ministry of Education issued the "Notice on Further Strengthening the Cooperation between Applied Undergraduate Colleges and Enterprises in Running Schools", which requires strengthening the strategic cooperation between applied undergraduate colleges and enterprises and promoting innovation in the mode of school-enterprise cooperation in running schools. In 2019, the State Council issued the "Several Opinions on Accelerating the Deep Development of Integration of Industry and Education", which proposed measures such as strengthening school-enterprise cooperation, improving policies and regulations, and increasing financial investment to promote industrial optimization and upgrading and improve the quality of talent training. In 2021, the Ministry of Education issued the "Guiding Opinions of the General Office of the Ministry of Education on Promoting the Deep Integration of Industry and Education", which proposed a series of policy measures to promote the deep integration of higher education and industry, including strengthening policy support for cooperation between schools and enterprises in running schools.

Collaborative education between schools and enterprises has been proposed for nine years since 2014, and although it has made significant progress, there are still many issues that need to be addressed. For instance, the curriculum system is not designed rationally, which fails to fully reflect the characteristics and requirements of collaborative education between schools and enterprises <sup>[2]</sup>.

The lack of institutions and mechanisms for managing collaborative education between schools and enterprises makes it difficult to form effective coordination and supervision. Schools, enterprises, students, and the government lack the motivation to collaborate, resulting in unclear responsibilities for collaborative education between schools and enterprises and low participation rates<sup>[3]</sup>. Enterprise engineers are busy with their KPIs and have no time to engage in collaboration with schools. Even if they wish to collaborate, they lack relevant experience and find it difficult to achieve high-quality collaboration between schools and enterprises. The collaborative education between schools and enterprises remains formalistic, with a single mode, low degree of combination of teaching content with employment and innovation, and entrepreneurship<sup>[4]</sup>. There is little interaction and learning between school teachers and enterprise instructors, making it difficult to achieve mutual empowerment. Blind spots and gaps exist in educational work, with many administrative and assessment difficulties<sup>[5]</sup>. In some regions, the planning and layout of educational resources, talent training levels and types, and industrial layout and development needs are not compatible, resulting in structural contradictions between talent supply and demand<sup>[6]</sup>.

How to solve these problems achieve true deep cooperation between schools and enterprises and the deep integration of industry and education? The theory of symbiosis provides a possible perspective. Symbiosis theory comes from biology, and the core concept is "heterogeneity coexisting", that is, different organisms form a mutualistic and symbiotic ecological balance in their interdependent relationship. Symbiosis is not only a biological phenomenon but also a social phenomenon<sup>[7]</sup>. Everything cannot exist independently, and every existence is interrelated and interacts with the surrounding environment and other existences. This interdependent relationship exists universally in the physical world, ecological systems, social organizations, and interpersonal relationships. Therefore, symbiosis theory can not only explain the mutualistic coexistence phenomenon in the biological world but also provide important guiding ideas for cross-border cooperation and collaborative development in human society. The term "ecosystem" also comes from biology, emphasizing the interrelationship and constraint between biological populations and the balance and stability of the entire ecosystem. It is similar to the symbiosis theory. In the cooperation between schools and enterprises, these two biological terms have new connotations, reflecting a deeper philosophical concept. Through the integration of industry and education, the coexistence and win-win situation of schools and enterprises jointly construct a "School-Enterprise Ecosystem", providing a beneficial ecological environment for talent cultivation. This cooperation is not only simple education and training, but also a mutual promotion at the philosophical level. Any unit cannot develop independently, and only in a relationship of cooperation and interdependence can ecological balance and social progress be achieved. In such cooperation, schools, and enterprises mutually benefit and promote each other, laying a solid foundation for sustainable social development. This cooperation model not only has practical significance but also is a philosophical way of thinking. Only in collaborative cooperation can a better future be created.

Based on the theory of symbiosis, this study explores the mechanism of cooperation and co-cultivation between private colleges and enterprises. The aim is to deepen the value connotation of symbiosis between schools and enterprises, explore the operational mechanism and promotion path of application-oriented undergraduate education and industrial integration, and establish a diverse, cyclical, and symbiotic "school-enterprise ecological circle." Such an ecological circle will facilitate better interaction between talent cultivation and social development in schools and promote mutual benefits between enterprises and private colleges.

## **2. The value connotation of the "School-Enterprise Ecosystem" from the perspective of symbiotic theory**

### **2.1. The origin and development of symbiotic theory**

The concept of symbiosis originates from biology, emphasizing mutualism and harmonious coexistence in biological systems. In 1997, the International Society for Symbiosis was founded in the United States, promoting research and application of symbiosis theory in different fields,

including transferring it to industrial symbiotic systems. In 1998, Yuan Chunqing innovatively proposed three elements of symbiotic units, symbiotic patterns, and symbiotic environments for the biological concept of symbiosis, and provided a theoretical framework for analyzing the state of symbiotic relationships.<sup>[8]</sup>

In recent years, the research on symbiosis theory has shown a trend of diversification and focus, gradually being applied to the issue of school-enterprise cooperation in higher education. School-enterprise cooperation is regarded as a symbiotic system, and the integration of industry and education is an important factor that jointly affects talent cultivation. The cooperation between schools and enterprises constitutes a "School-Enterprise Ecosystem" constructed by symbiotic units, symbiotic modes, and symbiotic environments. In this ecosystem, schools and enterprises are interdependent, mutually beneficial, and grow together to achieve win-win outcomes.

## **2.2. The connotation of the "School-Enterprise Ecosystem"**

The "School-Enterprise Ecosystem" is a new form of organization that is based on the common values and interests of schools, enterprises, students, and society. Through the reform of the integration system and mechanism of industry and education, it forms a symbiotic and innovative entity. Its formation is based on the needs of today's economic development, as well as the deep cooperation between schools, enterprises, students, and society. The entity is not only for the deep cooperation in aspects such as talent cultivation, technological innovation, social services, employment and entrepreneurship, and cultural inheritance, but also to meet the needs of economic development and provide talent support and intellectual services for the industry/enterprise. In the environment of the "School-Enterprise Ecosystem", schools, enterprises, students, and society depend on and promote each other, achieving common development and symbiosis. To achieve this goal, schools and enterprises need to work together, actively cultivate talents, participate in cooperation, and continuously promote the deep development of school-enterprise cooperation.

## **2.3. The fit between the "School-Enterprise Ecosystem" and symbiotic theory**

The "School-Enterprise Ecosystem" is the source of vitality for modern education, where schools, enterprises, students, and society are interdependent partners who work together, benefit from each other, achieve mutual success, and jointly fulfill the noble mission of talent cultivation. The dual-subject theory of production-education integration guides the contractual relationship between schools and enterprises, establishes a new form of organization, and realizes a systematic management approach. This approach not only promotes student education but also drives social development, creating a virtuous cycle of harmonious coexistence. This symbiotic relationship is not simply about attachment or exploitation, but rather a spirit of equal, close, democratic, and innovative cooperation. This is just like the symbiotic theory in biology, which reveals that inter-species relationships are not about one-way influence or competition, but about multi-directional interaction or cooperation.

The "School-Enterprise Ecosystem" is consistent with the theory of symbiosis. The theory emphasizes the systemic and holistic nature of symbiotic units, and the characteristics of interdependence, integration, interaction, and mutual achievement in the "School-Enterprise Ecosystem" highlight the systemic and holistic nature of the four symbiotic units: schools, enterprises, students, and society. The theory emphasizes the goal of consistency among symbiotic units, and as a symbiotic innovation entity, the "School-Enterprise Ecosystem" has a consistent goal of talent cultivation and social service, maximizing the interests of both schools and enterprises and optimizing social benefits. The theory emphasizes the mutual benefit among symbiotic units, and the "School-Enterprise Ecosystem" promotes resource sharing and value co-creation among schools, enterprises, students, and society through effective cooperation and incentive mechanisms, improving the capabilities and qualities of both schools and enterprises. The theory emphasizes that the symbiotic environment is the basis for the survival and development of symbiotic units, and the formation and improvement of the "School-Enterprise Ecosystem" require the coordination and support of multiple environments, such as national policy guidance, institutional guarantees of schools, and practical innovation of departments.

### 3. The operating mechanism of the "School-Enterprise Ecosystem" from the perspective of symbiotic theory

#### 3.1. The interaction mechanism of symbiotic units in the "School-Enterprise Ecosystem"

According to the theory of symbiosis, symbiotic units refer to individuals or groups that are interdependent, interrelated, and mutually beneficial in a symbiotic environment. In the "School-Enterprise Ecosystem", schools, enterprises, students, and society are four symbiotic units, which through various interaction mechanisms, achieve the flow of resources, exchange of information, creation of value, and goal achievement. There are four interaction mechanisms, as shown in Figure 1.

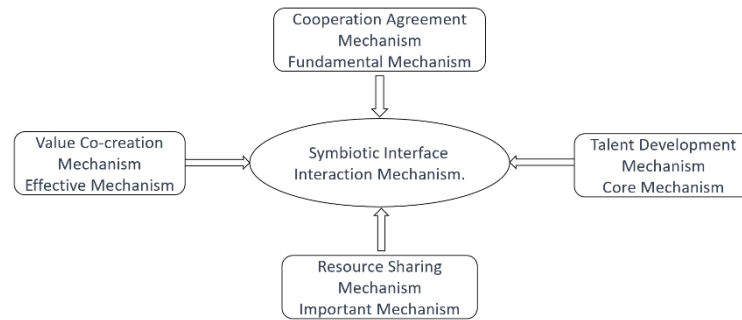


Figure 1 The interaction mechanism of symbiotic units in the "School-Enterprise Ecosystem".

In terms of cooperation agreement mechanisms, it is a fundamental mechanism for establishing cooperative relationships. By signing a cooperation agreement, the rights and obligations of both parties are clarified, their behaviors and responsibilities are standardized, and their interests and trust are guaranteed. The cooperation agreement can cover multiple aspects, such as talent cultivation, scientific research cooperation, technology transfer, and social services, with flexibility and diversity.

In terms of talent development mechanism, it is the core mechanism to achieve the goal of talent development. By establishing a school-enterprise joint training model, it realizes the need for matching, curriculum alignment, faculty cooperation, and practical cooperation in talent development. The school-enterprise joint training mode can take various forms, such as order-based training, targeted training, dual-system training, and work-study integration training, which are targeted and effective.

In terms of resource sharing mechanisms, it is an important mechanism for achieving optimal resource allocation. By establishing a school-enterprise resource-sharing platform, resources are shared, complemented, and assisted in a mutually beneficial way. The resource-sharing platform can include various types of resources such as educational resources, scientific research resources, technological resources, equipment resources, etc., and has openness and innovation.

In terms of value co-creation mechanism, it is an effective mechanism for achieving maximum value. By establishing a school-enterprise value co-creation model, it realizes collaborative creation, shared benefits, and sustained growth of value. The value co-creation model can involve multiple levels such as intellectual property, technological achievements, and social benefits, and has characteristics of collaboration and sustainability.

The above four interaction mechanisms not only promote the symbiotic development between schools and enterprises but also benefit the two symbiotic units of students and society. As the main body of talent cultivation, students can improve their abilities and qualities in various aspects by participating in the "School-Enterprise Ecosystem". For example, through the school-enterprise joint training mode, students can receive dual education from both schools and enterprises, organically combining theoretical knowledge and practical skills to improve their professional level and comprehensive ability; through the school-enterprise resource sharing platform, students can use high-quality resources from schools and enterprises to expand their learning channels and methods, improve their learning efficiency and effectiveness; through the school-enterprise value co-creation mode, students can participate in the school's and enterprise's scientific research projects and

technological achievements, cultivate their innovation awareness and ability, and improve their scientific research and technical level; through the school-enterprise cooperation agreement mechanism, students can understand the talent needs and standards of schools and enterprises, adjust their career planning and goals, and improve their professional quality and employability.

As the object of talent cultivation, society can promote its development and progress in multiple aspects by supporting the "School-Enterprise Ecosystem". For example, society can provide policy, funding, and environmental support for schools and enterprises through the mechanism of school-enterprise cooperation agreements, which motivates them to strengthen their cooperation and improve their efficiency and effectiveness. Through the value co-creation model of school-enterprise collaboration, society can enjoy the research and technological achievements of schools and enterprises, promote industrial upgrading, technological innovation, and economic growth, and improve the economic and technological level of society. By sharing resources on the school-enterprise platform, society can draw on the excellent experiences and practices of schools and enterprises to improve its management systems and operational mechanisms, and thus improve its management and operational level. Through the joint training mode of school-enterprise collaboration, society can absorb outstanding talents trained by schools and enterprises to meet the talent demands and standards of society, and improve the talent level and quality of society.

Therefore, the four symbiotic units in the "School-Enterprise Ecosystem" constitute a complete education system, which achieves a closed loop and cycle of education through various interactive mechanisms.

### 3.2. The construction mechanism of the symbiotic model in the "School-Enterprise Ecosystem"

According to the theory of symbiosis, the symbiotic mode refers to a stable, mutualistic, coordinated, and dynamic interaction between symbiotic units. The symbiotic mode characteristics in the "School-Enterprise Ecosystem" are shown in Table 1.

Table 1 The symbiotic mode characteristics in the "School-Enterprise Ecosystem".

Characteristics	Description
Win-win symbiosis mode	The win-win symbiosis model, in which symbiotic units complement each other's resources, mutually benefit each other's interests, and reach common goals through cooperation, enhances their competitiveness and development potential.
Mutually beneficial symbiosis mode	The balanced symbiosis model, in which symbiotic units achieve resource balance, fair interests, and coordinated goals through exchanges, maintains their stability and harmony.
Complementary symbiosis mode	The optimized symbiosis model, in which symbiotic units optimize resources, maximize interests, and improve efficiency through integration, enhances their innovation and efficiency.
Interdependent symbiosis mode	The close symbiosis model, in which symbiotic units achieve resource connectivity, consistent interests, and unified goals through interdependence, enhances their trust and loyalty to each other.

According to the above characteristics, the symbiotic mode in the "School-Enterprise Ecosystem" includes not only the two basic modes of behavioral symbiosis and organizational symbiosis<sup>[9]</sup> but also two additional modes of teaching symbiosis and service symbiosis, as shown in Table 1. The behavioral symbiosis mode in the "School-Enterprise Ecosystem" includes four types: parasitic symbiosis, skewed mutualism, asymmetric mutualism, and symmetric mutualism. The organizational symbiosis mode in the "School-Enterprise Ecosystem" includes four types: point symbiosis, intermittent symbiosis, continuous symbiosis, and integrated symbiosis. The symbiotic theory reveals the evolutionary law of the symbiotic mode system, that is, the "integrated-symmetric mutualism" mode is a symbiotic way for a symbiotic system to achieve a perfect state and the most efficient resource utilization. It is also the ultimate goal of symbiotic evolution. The school's research centers, industry academies, innovation platforms, and other educational models are a new type of

collaborative platform for "political, industrial, academic, research, and application" integration created by multiple cooperative entities such as society, schools, industrial enterprises, and students under the guidance of common goals, values, visions, and interests, laying a long-lasting, harmonious, win-win, and innovative path for the "School-Enterprise Ecosystem".

In the "School-Enterprise Ecosystem," the symbiotic teaching model includes four types: curriculum co-construction, project co-creation, practice resource sharing, and achievement co-evaluation. Curriculum co-construction refers to the cooperation between schools and enterprises in curriculum design, development, and implementation to create a curriculum system that meets market and learning needs, and improves the quality and effectiveness of courses. Project co-creation refers to the cooperation between schools and enterprises in scientific research projects, technology projects, innovation projects, etc., to create project outcomes with innovative and social value, and to improve the level and influence of projects. Practice resource sharing refers to the cooperation between schools and enterprises in laboratories, factories, bases, etc., to create mutually accessible practice resources and improve the conditions and opportunities for practice. Achievement co-evaluation refers to the cooperation between schools and enterprises in evaluating learning outcomes, scientific research outcomes, technology outcomes, etc., to form a fair and effective evaluation system, and to improve the standards and credibility of evaluation.

For schools, as the education subject in the "School-Enterprise Ecosystem," they are responsible for providing educational ideas, educational goals, educational resources, etc., collaborating with enterprises to plan teaching programs, working with students to complete teaching tasks, and collaborating with society to promote educational development. For enterprises, as the industrial subject in the "School-Enterprise Ecosystem," they are responsible for providing industry demands, industry environment, industry resources, etc., collaborating with schools to develop teaching content, working with students to carry out teaching practice, and collaborating with society to promote industrial progress.

For students, as the talent subject in the "School-Enterprise Ecosystem," they are responsible for providing talent demands, talent potential, talent resources, etc., collaborating with schools to acquire teaching knowledge, working with enterprises to solve teaching problems, and collaborating with society to demonstrate teaching achievements. Society, as the environmental subject in the "School-Enterprise Ecosystem," they are responsible for providing environmental demands, environmental changes, environmental resources, etc., collaborating with schools to evaluate teaching effectiveness, working with enterprises to certify teaching quality, and collaborating with students to share teaching values.

The symbiotic service model in the "School-Enterprise Ecosystem" includes four types of services: information services, consulting services, training services, and employment services. Among them, information services refer to the collection, organization, publication, and sharing of information between schools and enterprises through the establishment of an information platform, which enhances the transparency and effectiveness of information and promotes the matching of talent supply and demand. Consulting services refer to the provision of professional consulting services by schools to help enterprises solve problems in management, technology, marketing, and other aspects, thereby improving their competitiveness and innovation capabilities. Training services refer to customized training services provided by schools to meet the different needs of enterprises for talents and improve the professional literacy and occupational skills of talents. Employment services refer to the provision of employment guidance, recommendation, recruitment, and other services by schools and enterprises to promote the quality and rate of student employment and achieve the effective allocation and optimization of talents. Schools, serve as service providers in the "School-Enterprise Ecosystem," responsible for providing service concepts, service goals, service resources, etc. They work with enterprises to develop service plans, collaborate with students to complete service tasks, and work with society to promote service development. For enterprises, they serve as service demanders in the "School-Enterprise Ecosystem," responsible for providing service demands, feedback, support, etc. They work with schools to determine service content, collaborate with students to participate in service processes and work with society to promote service progress. Students,

serving as service beneficiaries in the "School-Enterprise Ecosystem," are responsible for providing service willingness, serviceability, service contribution, etc. They work with schools to acquire service knowledge, collaborate with enterprises to solve service problems and work with society to demonstrate service achievements. For society, they serve as service supervisors in the "School-Enterprise Ecosystem," responsible for providing service standards, service evaluation, service certification, etc. They work with schools to assess service effectiveness, work with enterprises to ensure service quality, and collaborate with students to share service value.

The symbiotic mode of the "School-Enterprise Ecosystem" can reflect the dynamic relationship between symbiotic units, maintain the sustainable and healthy development of symbiotic relationships among schools, enterprises, students, and society, and ensure the smooth operation of the integrated development of the "School-Enterprise Ecosystem." To effectively promote the harmonious symbiosis of production and education integration, it is necessary to vigorously improve this symbiotic mode, eliminate unreasonable elements, and scientifically construct a new symbiotic mode that is compatible with the current development of private applied undergraduate education. Starting from each symbiotic unit and grasping the key to problem-solving, the improvement of the symbiotic mode of the "School-Enterprise Ecosystem" should be constructed as a systematic project, as shown in Figure 2.

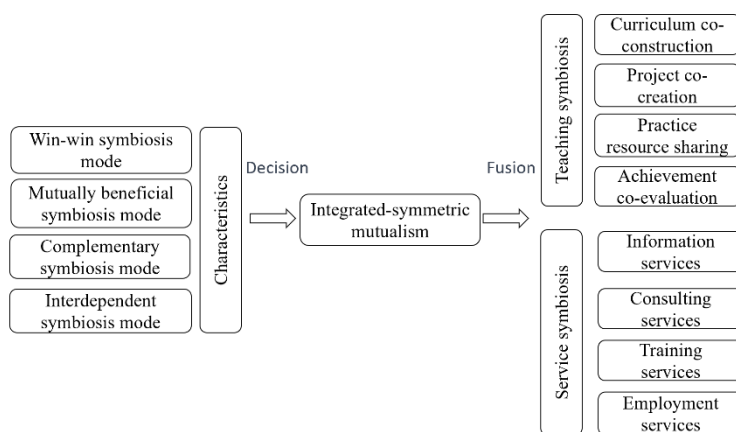


Figure 2 Building symbiosis models.

### 3.3. The strengthening mechanism of the symbiotic environment in the "School-Enterprise Ecosystem".

The symbiotic theory holds that symbiotic environments can have three possible effects on symbiotic units: promotion, inhibition, or irrelevance. Similarly, symbiotic units can have three possible effects on symbiotic environments: enhancement, damage, or neutrality. To construct a symbiotic environment for the "School-Enterprise Ecosystem," it is necessary to regulate incentive mechanisms to ensure that the interactions between the symbiotic environment and symbiotic units develop in a positive direction and avoid negative developments.

The positive symbiotic environment of the "School-Enterprise Ecosystem" is a multi-level structure, which is jointly constructed by the national, school, and departmental levels. At the national level, policy guidance and support are provided, while at the school level, institutional safeguards and innovation are provided, and at the departmental level, practical platforms and opportunities are provided. These three levels coordinate and promote each other, forming a symbiotic environment that is conducive to the collaborative education of schools and enterprises and the integration of production and education, as shown in Figure 3.

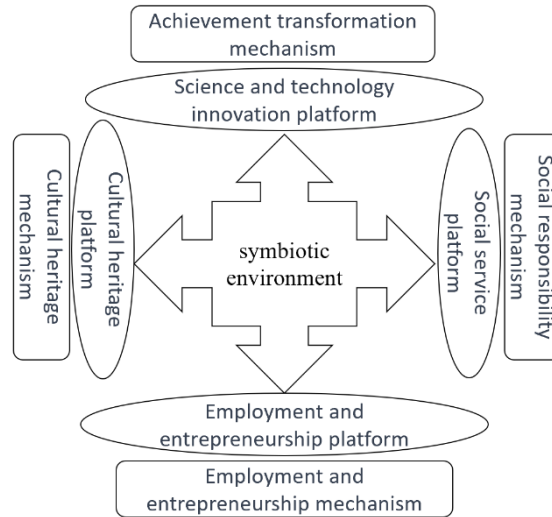


Figure 3 The symbiotic environment in the "School-Enterprise Ecosystem".

The school and enterprise jointly establish talent training bases and training platforms, implement various forms of talent training modes such as order-based, directed, and customized, and improve the targeting and adaptability of talent training. The school and enterprise jointly establish scientific and technological innovation platforms and achievement transformation mechanisms, implement various forms of scientific and technological innovation modes such as industry-school-research cooperation, joint tackling of key problems, and sharing of resources, and improve the efficiency and effectiveness of scientific and technological innovation. The school and enterprise jointly establish social service platforms and social responsibility mechanisms, implement various forms of social service modes such as school-enterprise cooperation services, school-enterprise interactive exchanges, and community co-construction, and improve the quality and influence of social services. The school and enterprise jointly establish employment and entrepreneurship platforms and employment and entrepreneurship mechanisms, implement various forms of employment and entrepreneurship modes such as school-enterprise mutual recommendations, joint training, and incubation support, and improve the level and success rate of employment and entrepreneurship. The school and enterprise jointly establish cultural inheritance platforms and cultural inheritance mechanisms, implement various forms of cultural inheritance modes such as joint cultivation, mutual learning, and integrated development of culture, and improve the intensity and depth of cultural inheritance.

#### 4. The promotion path of the "School-Enterprise Ecosystem" from the perspective of symbiotic theory

##### 4.1. Promoting the generation and transmission of energy in the "School-Enterprise Ecosystem"

Energy is the source and driving force for the symbiosis of all parties in the "School-Enterprise Ecosystem". To build a harmonious and symbiotic "School-Enterprise Ecosystem", it is necessary to promote the flow and transformation of energy. Therefore, in order to enhance the synergy, integration, and symbiosis of all parties in the "School-Enterprise Ecosystem", efforts should be made to address the problem of insufficient or unbalanced energy. The responsibilities and rights of all parties need to be clearly defined, and the balance of production-education integration is the foundation of the "School-Enterprise Ecosystem". Schools should formulate rules and regulations to clarify the roles, norms, and guidance of all parties in the "School-Enterprise Ecosystem". Only by fulfilling their responsibilities and relying on each other, can new energy be created. To stimulate the vitality of the "School-Enterprise Ecosystem", energy needs an initial driving force. This driving force can come from the internal or external of the "School-Enterprise Ecosystem", and its purpose is to stimulate the vitality of the "School-Enterprise Ecosystem" and promote the generation of energy.



To promote the construction of the "School-Enterprise Ecosystem", it is necessary to promote the transmission of energy, and "dialogue" is an effective way. Through various forms of "dialogue", consensus can be reached on the construction of the "School-Enterprise Ecosystem" and spiritual encounters can be realized. Dialogue is beneficial to the construction and development of symbiotic relationships, makes the energy in the "School-Enterprise Ecosystem" flow efficiently, improves transmission efficiency, and reduces transmission resistance. By establishing platforms for "dialogue" and communication such as research centers, industry colleges, and innovation platforms, the transmission of energy and information between symbiotic units in the "School-Enterprise Ecosystem" can be made smoother and more effective.

#### **4.2. Realizing the sharing and win-win of achievements in the "School-Enterprise Ecosystem"**

Guided by the theory of symbiosis, schools, enterprises, students, and society have formed a harmonious "School-Enterprise Ecosystem" in an integrated manner, which benefits each other, shares achievements, and wins the future. This is a symbiotic model of energy balance, which can allow each symbiotic unit to achieve the greatest satisfaction and development. To achieve this goal, it is necessary to start from the following four aspects:

First, analyze the needs, advantages, resources, and goals of the four symbiotic units, clarify the boundaries and structure of the symbiotic system, and make them coordinate and consistent. Schools can analyze their own educational philosophy, talent cultivation goals, professional settings, and faculty, determine the direction and scope of cooperation with enterprises; enterprises can analyze their own development strategies, talent needs, technological levels, and market competition, and determine the content and methods of cooperation with vocational colleges; society can analyze its own policy orientation, social needs, industrial development, and determine the support and guarantee for cooperation with schools and enterprises.

Secondly, establish and improve the rules, mechanisms, and platforms of the symbiotic system, promote information exchange, resource sharing, and energy conversion among the four symbiotic units, and support each other. Schools can establish platforms such as school-enterprise cooperation committees, school-enterprise joint laboratories, and school-enterprise joint training bases to exchange information, share resources, and transform energy with enterprises. Enterprises can establish mechanisms such as enterprise mentorship systems, enterprise scholarships, and enterprise order class systems to exchange information, share resources, and transform energy with vocational colleges. Society can establish rules such as the industry-education integration development fund, industry-education integration development award policies, and industry-education integration development evaluation standards to exchange information, share resources, and transform energy with schools and enterprises.

Third, implement a compound talent development plan, strengthen cooperation in teaching, scientific research, and services between schools and enterprises, improve the quality and efficiency of talent development, and promote mutual development. Schools and enterprises can jointly formulate talent development plans, curriculum systems, teaching contents, assessment methods, and other measures to align teaching contents with enterprise needs. They can also jointly carry out scientific research projects, technological innovation, and achievement transformation to align scientific research results with enterprise development. In addition, they can jointly provide social services, technical consulting, training guidance, and other measures to align social services with enterprise impact

Fourth, establish and improve the evaluation and supervision system of symbiotic systems, periodically detect the operating status of symbiotic systems, and timely adjust symbiotic strategies and measures to improve them. Schools can establish a joint evaluation index system, a joint satisfaction survey form, and a joint cooperation effectiveness report to periodically detect the quality and effectiveness of joint cooperation. Enterprises can establish an enterprise demand analysis form, an enterprise feedback form, an enterprise benefit analysis form, and other measures to periodically detect enterprise needs and benefits. Society can establish a supervision organization for the integration of production and education, an assessment system for the integration of production and

education, and a reward and punishment mechanism for the integration of production and education to periodically detect the level and achievements of the integration of production and education.

### **4.3. Creating a good symbiotic environment in the "School-Enterprise Ecosystem"**

The symbiotic environment is the cornerstone and guarantee for the construction of the "School-Enterprise Ecosystem", which determines the vitality of symbiotic units and the stability of symbiotic relationships, and is a key factor in promoting the development of industry-education integration. Specifically, at the macro level, the state has regarded deep integration between schools and enterprises as a national strategy, and meetings and policies issued have provided policy guidance and institutional support for the construction of the "School-Enterprise Ecosystem". For example, in July 2022, the Ministry of Education Office, the Ministry of Industry and Information Technology Office, and the National Intellectual Property Office jointly issued the "Notice on Organizing the 'Thousand Schools, Ten Thousand Enterprises' Collaborative Innovation Partner Action", promoting deep integration between schools and enterprises, and actively serving and integrating into the new development pattern <sup>[10]</sup>.

At the meso level, schools have also increasingly attached importance to the integration of industry and education, providing various platforms such as scientific and technological innovation competitions, internships, and practical training for students, and offering talent cultivation and innovation services for the construction of the "School-Enterprise Ecosystem". For instance, the integrated training base is an important component of private applied undergraduate education and also a key driver of educational reform. The integrated training base is different from traditional training bases, as schools and enterprises work together to maximize their respective strengths. Enterprises participate in the planning of internship and practical courses, as well as the standards for course construction, while schools participate in the entire process of enterprise production and management.

At the micro level, departments within schools are the most direct environment affecting the construction of the "school-enterprise ecological circle," and they are increasingly focusing on the interactions among various symbiotic units. The construction of various "dialogue" platforms continues to advance, providing communication, coordination, and resource integration for the construction of the "school-enterprise ecological circle." For example, Tencent Cloud has collaborated with multiple schools to build a learning platform based on Tencent Cloud, enabling students to use real Tencent Cloud resources for training anytime and anywhere <sup>[11]</sup>. At the same time, Tencent Cloud also provides schools with services such as teacher training, course development, and experimental guidance, creating a comprehensive school-enterprise cooperation ecosystem.

## **5. Conclusion**

From an ecological perspective, the "School-Enterprise Ecosystem" is an organic whole, and its vitality comes from the synergy of symbiotic units, innovation of symbiotic modes, and optimization of the symbiotic environment. Therefore, building a "School-Enterprise Ecosystem" requires joint efforts from all parties. Schools, enterprises, students, and society should seek mutual benefits and form symbiotic units. They should be brave in exploration and create symbiotic modes and support each other in optimizing the symbiotic environment, thereby achieving the improvement of talent cultivation and the rapid development of the regional economy.

## **Acknowledgements**

Funding project: Geely University of China, Special fund for education and teaching reform in 2022, Research on Talent Training based on the Integration of Industry and Education and School-enterprise Cooperation (No:2022xjgglz65).

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