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Research on the Path Construction of Interdisciplinary Talent Training Ecosystem Driven by New Quality Productive Forces

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Abstract: *Due to issues with topic separation, practice disconnection, and inadequate coordination, the old industry-education integration model finds it challenging to meet the demands of developing new, high-quality productive forces. This study proposes a collaborative path for constructing an interdisciplinary talent cultivation ecosystem in the integration of industry and education. It does this by explaining the meaning and necessity of the ecological circle of interdisciplinary talents training in the integration of industry and education from the perspectives of ecology and system theory. According to the research, the ecosystem's construction must use "interdisciplinary-industrial demand-technology integration" as the synergy link. This can be accomplished through four mechanisms: First, rebuilding the multidisciplinary curriculum system, breaking down barriers between traditional disciplines, and designing modular courses based on industrial problems; Second, creating a "school-enterprise-research" collaborative innovation platform, integrating university scientific research resources and enterprise production scenarios, and encouraging the practical education of "real work"; Third, creating a multi-subject collaborative governance mechanism with policy guidance, benefit sharing, and risk sharing to create an ecological closed loop of innovation factor flow; Fourth, establishing an evaluation system of industrial contribution, and encouraging the shift in education from "knowledge transfer" to "ability generation" through quality control.*

Keywords: *New Quality Productive Forces; Talent Training Ecosystem; Integration of Production and Education; Ecosystem for Talent Training*

1. Introduction

New quality productive forces have emerged as the primary driver of superior economic development against the backdrop of the world's scientific and technological revolution and industrial change. Artificial intelligence, quantum computing, biotechnology, and new energy are examples of strategic emerging sectors that are radically changing the conventional industrial form and giving rise to new models and forms [1-3]. However, in adapting to this shift, China's higher education system encounters serious structural inconsistencies. Colleges and universities continue to teach talent training in a single area, with a rigid knowledge structure and few real-world examples. Because of this, students find it challenging to adjust to solving complicated technical and transdisciplinary difficulties. However, enterprise technology iterations happen significantly more quickly than college curriculum renewals. The skills of recent graduates do not match industry demands. From a theoretical standpoint, there is a dearth of systematic research on the law of "discipline-industry-technology" collaborative evolution driven by new quality productive forces [4-5]. Instead, the majority of the existing research concentrates on the mechanism of innovation of industry-education integration or the exploration of interdisciplinary education modes. By creating the multi-subject collaborative network of "university-enterprise- government-scientific research institution", this study creatively proposes the "ecosystem" construction framework, which aims to transcend the linear thinking of traditional "school-enterprise cooperation" and realize the dynamic coupling of knowledge production, technological innovation, and industrial application [6-7].

2. An explanation of the ecosystem's meaning

2.1 Fundamental meaning

Driven by new quality productive forces, guided by industrial demand, and coordinated by multiple subjects such as universities, enterprises, governments, and scientific research institutions, the interdisciplinary talent cultivation ecosystem of industry-education integration (henceforth referred to as the "ecosystem") is an open system of deep integration of the "education chain-industry chain-innovation chain". Its main goal is to overcome the constraints of conventional industrial division and discipline boundaries. The goal is to achieve the dynamic connection of industrial application, technological innovation, and knowledge generation. Its goal is to develop multidisciplinary skills, an awareness of innovation, and industry flexibility.

2.2 Connotation element analysis

2.2.1 Synergy between subjects

The ecosystem encompasses a variety of topics, including scientific research institutes (technological research subjects), governments (policy guidance subjects), businesses (technological application subjects), and universities (knowledge creation subjects). Through the process of benefit and risk sharing, all stakeholders establish a cooperative network of "government, industry, university, research, and application". For instance, real-world industrial scenes are provided by businesses, interdisciplinary resources are integrated by universities, scientific research institutions overcome important technologies, and talent training and industrial innovation are jointly promoted. The government has also issued a special policy on the integration of industry and education. The collaboration network is displayed (Figure 1).

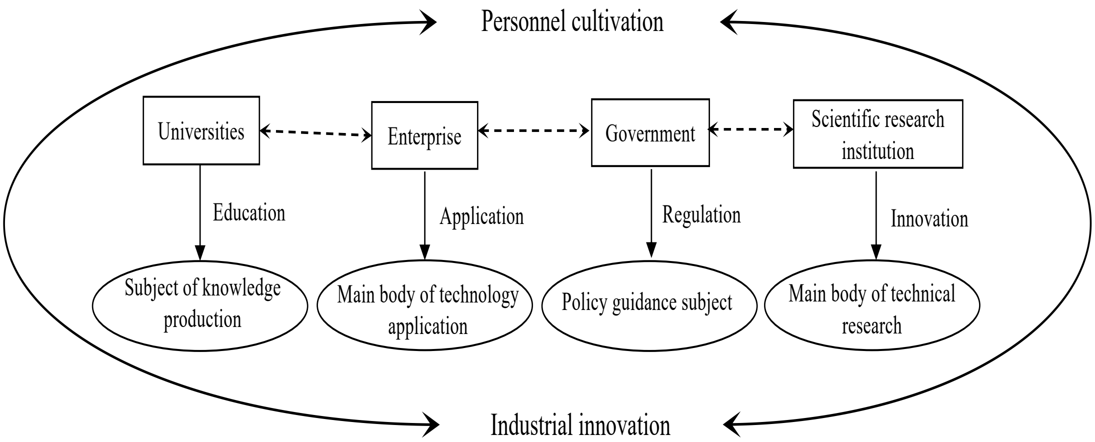

Figure 1. The cooperation network "Government-industry-university-research-use"

2.2.2 Transboundary knowledge

Dismantle the boundaries between conventional disciplines and rebuild the interdisciplinary curricular system using technical and industrial issues as a springboard. Civil engineering, management, electronic information, control science, and other disciplines are combined in the field of intelligent construction, for instance, to create an interdisciplinary module called "civil engineering-management-electronics-control" that develops students' capacity to tackle challenging real-world engineering issues.

2.2.3 The push for technology

We will encourage the coordinated transformation of industrial and educational forms, with new productivity technologies like artificial intelligence, big data, the Internet of Things, and new energy serving as the main motivators. For instance, the AI algorithm is utilized to optimize the talent training path, the digital platform is used to achieve the real-time exchange of school- enterprise resources, and the industrial scene is constructed using virtual simulation technology.

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2.2.4. Openness to the environment

The ecosystem must continue to take in new models, industries, and technologies since it exhibits the traits of dynamic evolution. For instance, the ecosystem must promptly modify the design of disciplines and training programs in order to stay in step with the emergence of new businesses like the digital economy and prefabricated constructions.

3. The value of creating an ecosphere

3.1 Meeting the Requirements of New High-Quality Production Forces

3.1.1 Propelled by industry upgrading and technological integration

Digitization, intelligence, and greenness including biotechnology, big data, artificial intelligence, and new energy are characteristics of modern productivity. strategic new sectors. Technological innovations in many domains necessitate the possession of multidisciplinary knowledge structures, such as the integration of bio-medicine, new energy, materials science, and artificial intelligence. The industry-education integration ecosystem creates a “discipline-industry -technology” collaborative innovation platform by combining the resources of universities, scientific research institutes, and businesses. This platform can swiftly adapt to the demands of technology iteration and develop complex innovative talents.

3.1.2 Innovation-driven development's strategic requirements

Original and subversive scientific and technical innovation, such brain-computer interfaces, quantum computing, and other frontier domains, are highlighted by new quality productive forces. By removing barriers across fields, the interdisciplinary talent training ecosystem encourages the deep integration of fundamental research and technological application. Multidisciplinary research in computer science, mathematics, and neuroscience, for instance, can foster algorithm innovation and industrial application in the field of artificial intelligence. It can also supply the fundamental kinetic energy for superior economic development.

3.2 Overcoming the constraints of conventional talent development

3.2.1 Professional disciplinary obstacles and fragmentation of knowledge

One discipline governs the traditional talent training style, which results in students having a single knowledge structure and makes it challenging for them to adjust to complicated technological difficulties. For instance, cooperative innovation in material science, mechanical engineering, and electronic information is necessary for the field of intelligent manufacturing. On the other hand, there is no multidisciplinary curriculum framework or teaching organization in the current educational system. The industry-education integration ecosystem creates interdisciplinary curriculum modules, like “intelligent manufacturing engineering”, through the “professional cluster + industrial college” model. This approach combines multidisciplinary knowledge like electronics, control, and machinery to enhance students' capacity to tackle challenging engineering problems.

3.2.2 Instruction is not up to date with industry demands

The majority of practical instruction in colleges and universities takes place in laboratories rather than in actual industrial settings. For instance, cooperative research and development of battery technology, intelligent driving, and vehicle networking is necessary for the new energy automotive sector. It is challenging to offer an integrative practice platform in traditional schooling. Students can learn interdisciplinary technology in real projects and reduce the gap between the supply of skilled workers and the demand for them in the industry by establishing practical bases like “factory in school” and “school in factory”, such as the intelligent networked automobile laboratories built by universities and auto companies.

3.3 Encourage the joint reform of the industrial and educational forms. One Close

3.3.1 Connection between the industrial and educational chains

In order to meet the demands of the new quality productive forces, the educational system must change from “knowledge transfer” to “ability orientation”. Through the “discipline-major- industry” docking mechanism, the industry-education integration ecosystem makes it possible to dynamically match educational material with industrial demand. Colleges and universities, for instance, modify their computer science curricula to meet the demands of the artificial intelligence sector. They include interdisciplinary courses like “AI + Finance” and “AI + Medical”. After graduation, students can directly connect with industrial opportunities.

3.3.2 Co-building an ecosystem for innovation

“University-enterprise-government-scientific research institutes” form a multi-party collaborative innovation network through the industry-education integration ecosystem. For instance, a closed loop of “technology research and development-achievement transformation- industrial application” is formed when universities and scientific and technological enterprises collaborate to build joint laboratories, the government offers financial and policy support, and scientific research institutions offer basic research support. Industrial upgrading and technological innovation can be accelerated by this cooperative process. For instance, businesses can swiftly turn university research findings in the area of quantum communication into profitable goods.

3.4 Enhancing the national innovation system's overall efficacy

3.4.1 Talent support for strategic developing industries

The new generation of important developing sectors, including biotechnology, new energy, and information technology, are the focus of new quality productive forces. Through the “interdisciplinary + industrial docking” approach, the interdisciplinary talent training ecosystem supplies talent reserves for these fields. In biomedicine, for instance, colleges collaborate with pharmaceutical firms to foster the “biotechnology + pharmacy + clinical medicine” compound talent and advance the creation and commercialization of novel medications.

3.4.2 The global scientific and technology competition's strategic plan

The ecosystem of industry-education integration boosts the national innovation system's international competitiveness in the face of global scientific and technical competition by promoting “international cooperation + local innovation”. For instance, universities and foreign research institutes collaborate to establish collaborative research centers, implement cutting-edge technologies from around the world, and conduct secondary innovation in response to local industry demands. For instance, in the sphere of new energy, the domestic car industry is used and transformed in conjunction with hydrogen energy technology, which has been mastered through international cooperation.

3.5 To achieve the concerted advancement of social development and educational equity

3.5.1 The necessity of a regional economy's coordinated development

The transition of the local economy from established to rising industries is facilitated by fresh, high-quality productive forces. By using the cooperative “local universities + local industries” paradigm, the industry-education integration ecosystem fosters regional innovation and development. For instance, certain colleges in the western region collaborate with nearby new energy companies to help local economic upgrading and transformation while developing local talent in “photovoltaic technology + energy management”.

3.5.2 The general enhancement of the capacity for social innovation

Through the process of “education popularization + innovation incubation”, the multidisciplinary talent training ecosystem improves society's capacity for innovation as a whole. For instance, science and technology parks and universities collaborate to create an innovation and entrepreneurship platform where students can work on actual business projects and support entrepreneurial teams during their academic careers. In the realm of artificial intelligence, for instance, student teams have created and commercialized intelligent instruction robots.

4. Research on the path construction of ecosystem

4.1 Discipline reconstruction: breaking barriers and building interdisciplinary professional clusters

In the era of rapid development of new quality productive forces, breakthroughs in industrial technology often stand out in interdisciplinary fields. For example, the deep integration of artificial intelligence and bio-medicine, which brings new possibilities for disease diagnosis and treatment? The cooperation of new energy and materials science promotes the innovation of the green energy industry. In the face of this trend, colleges and universities shoulder the important task of cultivating innovative talents. They must break the boundaries of traditional disciplines and reconstruct the curriculum system based on industrial needs. Although the traditional division of disciplines has its rationality, it is difficult to meet the industry's needs for compounding talents. This is in the context of new quality productive forces development. Therefore, colleges and universities should actively explore the collaborative education mode of “professional cluster + industrial college”. Taking the field of intelligent manufacturing as an example, mechanical engineering, electronic information, material science and other majors can be integrated into the “intelligent manufacturing engineering” professional cluster. On this basis, interdisciplinary course modules covering multidisciplinary knowledge are set up, such as intelligent manufacturing system design, intelligent material application etc. Through this model, students can access the knowledge and methods of different disciplines. They can cultivate the ability to solve complex engineering problems, and better adapt to industrial development needs. In this way, colleges and universities can provide solid talent support for the development of new productivity and promote the industry to a new height.

4.2 Platform co-construction: two-way empowerment, build a “school-factory-school” practice platform

The core essence of the industry-education integration ecosystem is to achieve deep integration of the education chain and the industrial chain, and to build a virtuous cycle system of mutual promotion and coordinated development. In this ecosystem, universities and enterprises cooperate no longer superficially, but go deep into the physical platform construction. The emergence of innovative models such as “factory in school” and “school in factory” provides a solid carrier for the integration of education chain and industrial chain. With its rich scientific research resources, colleges and universities inject innovative vitality into enterprises; with its real production scene, the enterprise provides a broad stage for practical teaching in colleges and universities. Taking the new energy automobile industry as an example, it is of great significance for colleges and universities to work together with relevant enterprises to build an intelligent networked automobile laboratory. Students are no longer limited to book knowledge, but can carry out practical learning in a real industrial environment in the laboratory. They can access the most cutting-edge technology and equipment, combine theoretical knowledge with actual operation, and master interdisciplinary technology. This practical learning method can not only improve students' professional skills and innovation ability, but also enable them to understand the needs of the industry. It can also shorten the gap between talent supply and industrial demand. Through this deep integration, colleges and universities can cultivate high-quality talents that are more in line with the needs of the industry, and enterprises can also obtain continuous innovation impetus to jointly promote the high-quality development of the industry.

4.3 Mechanism of innovation: multi-coordination buildings an ecosystem governance system

In addition to universities, enterprises, governments, and scientific research institutions, the industry-education integration ecosystem is complex and diverse. Building a collaborative governance mechanism is the key to its healthy development. As a guide, the government should play a macro-control role. On the one hand, formulate targeted special policies for the integration of industry and education, and point out the direction for the integration of industry and education at the policy level, such as giving policy incentives such as tax incentives and land support; on the other hand, a special support fund is set up to provide financial support for the integration of industry and education, and to help universities and enterprises carry out in-depth cooperation. Enterprises are leaders in technological innovation. With keen market insight and rich practical experience, they determine technological innovation direction. At the same time, enterprises should actively provide practical scenarios and resources to provide college students with practical training opportunities. This is so that they can accumulate experience in practice and improve their ability to solve practical problems. Colleges and universities bear the important mission of talent training and scientific research innovation. Promote the “industry professor” system, hire enterprise experts to participate in teaching. This will bring industry frontier knowledge and practical experience into the classroom, and make the teaching content more in line with the needs of industry. Scientific research institutions provide basic research support for the integration of industry and education, carry out cutting-edge technology research, form a closed loop of “technology research and development-achievement transformation-industrial application", promote the transformation of scientific research achievements into actual productivity, and promote industrial upgrading. The main bodies of all parties perform their duties and cooperate with each other to jointly promote the prosperity and development of the industry-education integration ecosystem.

4.4 Evaluating reform: quality control, the establishment of an industrial contribution evaluation system

The traditional education evaluation system has been dominated by final assessment results for a long time. Too much attention is paid to the results of test papers. This single evaluation method is difficult to fully and truly reflect the effectiveness of production and education integration. With the deepening of industry and education integration, it is urgent to establish a scientific and reasonable evaluation system. It is an inevitable choice conforming to the development of the times to build an evaluation system with "industrial contribution" as its core. The system should include the solution of technical problems encountered by enterprises in technological innovation. It should also include the effect of patent transformation and application, and the actual value of innovation and entrepreneurship achievements. This should be included in the assessment indicators of colleges and universities. These indicators intuitively reflect the contribution of colleges and universities to industrial development in the process of industry-education integration taking practical teaching as an example, the traditional mode of evaluating graduation designs based on paper quality is changed. The project results of students' enterprise practice are taken as an important evaluation standard for graduation designs. Students participate in practical projects in enterprises; can access industry cutting-edge technology and real production scenarios, and exercise comprehensive ability in solving. By constructing an evaluation system with "industrial contribution" as the core, it can guide colleges and universities to pay more attention to close integration with the industry, promote the transformation of education from "knowledge transfer" to "ability generation", cultivate more high-quality talent to meet the needs of industrial development, and provide strong support for industrial upgrading and economic and social development.

5. Conclusions

An unavoidable option for the coordinated reform of industrial and educational forms is the development of an interdisciplinary talent cultivation ecosystem powered by new quality productivity. It can support technological integration, industrial upgrading, innovation-driven growth, and the development needs of new quality productive forces. It can also overcome the constraints of conventional talent training methods, dismantle discipline barriers, and address the issue of the disconnect between real-world instruction and industry demands. In order to improve the overall efficiency of the national innovation system, provide talent support for strategic emerging industries, and boost global scientific and technological competitiveness, it is important to support the coordinated reform of education and industrial forms, realize the deep integration of education and industrial chains, and collaboratively build an innovation ecosystem. Additionally, it is important to realize the coordinated promotion of educational equity and social development, promote the coordinated development of regional economies, and improve society's overall capacity for innovation. In the construction approach, the integration of production and education can be advanced from "physical superposition" to "chemical integration" by utilizing the four dimensions of discipline reconstruction, platform co-construction, mechanism innovation, and evaluation reform. This approach offers ongoing talent kinetic energy and intellectual support for the creation of new quality productivity. The ecosystem's dynamic flexibility will need to be further strengthened in the future. New digital empowerment mechanisms must be investigated, and the difficulties of industrial upgrading and technical iteration must be addressed.

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