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Practice and Thinking of Constructing School-enterprise Cooperation and Innovative Talent Training System for New Engineering

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Abstract

School-enterprise cooperation and work-study combination are important measures for cultivating collaborative innovative talents under the background of new engineering education. Through in-depth investigation of the current situation of school-enterprise cooperation talents training, this paper analyzes the existing problems and reasons. Drawing on the experience of advanced collaborative innovation at home and abroad, according to the talent teaching mode in colleges and universities, relying on industrial development and the reality of new engineering education, an innovative scientific research platform and a production-study-research project are established to form a collaborative talent training mode with the integration of theory and practice, the integration of production and education, and the co-construction and sharing of innovation centers. Practice shows that the deep combination of engineering training can effectively cultivate students application and innovation ability, and the good interaction between school and enterprise cooperation can also improve the innovation strength of enterprises.

Keywords

School-enterprise cooperation; Cultivation of innovative talents; New engineering; Work-study combinatio.

1. Introduction

China is in a critical period of a new round of industrial layout and technological change. In response to the requirements of the national innovation-driven development strategy, since February 2017, the Ministry of Education has actively promoted the reform of discipline construction and talent training mode in colleges and universities, promoted the development path of new engineering construction, encouraged colleges and universities to establish the " new concept " of engineering talent training and explore the " new mode " of engineering talent training based on the needs of new economy and new formats in the new era.

At present, the problem of "emphasizing theory but weak application" exists in the design of engineering talents training system in colleges and universities. Most colleges and universities mainly focus on papers, undertaking projects, science and technology awards, etc., but pay insufficient attention to the application and transformation of their scientific research achievements,which also aggravates and widens the gap between university research

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achievements and engineering applications. Respectively, Wang Jiangzhe [1], Zhu Guilong [2], etc. from the perspective of intellectual property protection and the perspective of colleges and universities, through analysis and research, it is found that the training mode of industry-university-research cooperation has a positive effect on improving the conversion rate of scientific research achievements in colleges and universities, and can effectively reduce the risk of research and development. Therefore, collaborative and efficient school-enterprise cooperation is positive and necessary for personnel training and scientific research innovation in colleges and universities [2, 3]. In this regard, many domestic universities and researchers have analyzed the drawbacks of the talent training system in colleges and universities in China, pointed out the development status and advantages and disadvantages of the existing school-enterprise cooperation, and put forward a series of new mechanisms for collaborative innovation of production, learning and research, which is a useful exploration for the in-depth integration of teaching and application in colleges and universities.

Based on the co-construction of R & D institutions, this paper constructs a collaborative innovation talent training system under the background of new engineering, and builds a talent training mechanism for joint training with enterprises based on provincial R & D platforms. Based on the research and development base of innovation center, the training mode of combining theory with practice is carried out, and the comprehensive training mode of multi-level, systematic student knowledge system and practical ability is designed, which provides solutions for the further promotion of school-enterprise cooperation in new engineering education.

2. Current Situation and Problems of University - Enterprise Cooperation

Industry-university-research cooperation is an effective way to solve the disconnection between school curriculum training and industrial practical application scenarios, and it is the key link of national innovation-driven development.Since the 18th National Congress of the Communist Party of China, the requirements of the Party Central Committee for industry-university-research have increased from ' close integration ' to ' deep integration '. The ultimate goal of university education is to improve the practical application ability of talents. The construction of university-industry-university-research in China has developed so far. Although there are various forms of collaborative innovation, there are still some shortcomings [7, 8].

(1) The depth of cooperation needs to be improved

General school-enterprise cooperation methods such as entrusted development and cooperative development are not deep enough in communication and cooperation between the two sides. The objective distance and organizational form of the two sides directly lead to the lack of close contact between the two sides. It is difficult for university teams to truly understand the technical pain points and difficulties of enterprises in a short period of time. Moreover, there are differences in assessment mechanisms between the two sides, which easily leads to the phenomenon of "two skins" in school-enterprise cooperation, which does not play a sufficient role in promoting R&D innovation of enterprises and personnel training in universities.

(2) The operational mechanism needs to be improved

School-enterprise cooperation teams are mostly formed temporarily, and there is a huge gap between the organization and management modes of universities and enterprises. Because of the different value orientations and interests demands of both parties, it is inevitable that there will be mutual constraints and inconsistent pace in the process of cooperation. Therefore, scientific, reasonable and unified organization and management operation mechanism is

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needed, and a clear management system is formulated to unify the project schedule and responsibilities, fully restrain and adjust the cooperation process, and realize the transformation of school-enterprise cooperation from close integration to deep integration.

(3) Insufficient precision and long-term effectiveness

At present, the government-led industry-university-institute innovation cooperation presents the characteristics of " one-time order ". Due to the lack of understanding and cooperation experience, both schools and enterprises tend to establish one-time cooperation based on technological R & D needs. As far as enterprises are concerned, generally based on the uncertainty of both sides and the need for technical confidentiality, they will not put forward the commission requirements of real core technical problems. For the university R & D team, it is difficult to form accurate and effective technical solutions due to the lack of understanding of enterprise status and technical requirements in a short time. Therefore, the traditional school-enterprise cooperation model is usually manifested in the form of "one case, one discussion", which is difficult to form a long-term, in-depth and accurate cooperation mechanism.

3. Achievement-oriented Collaborative Innovation Mechanism of Production, Education and Research

Scientific and technological innovation of production, education and research involves several elements, such as universities, enterprises, people and environment. Universities play a prominent role in social and economic development and scientific and technological innovation.The collaborative innovation mechanism of school-enterprise alliance and work-study combination can effectively allocate innovative resources of both sides. In recent years, in order to comprehensively promote the construction of collaborative innovation training mechanism for applied and innovative talents, actively deepen exchanges and cooperation with enterprises, jointly prepare for the construction of provincial R&D platforms for technological innovation centers and engineering research centers, combine the teaching advantages and talents advantages of schools with the technological advantages, resource advantages and industry advantages of enterprises, and establish a "work-study combination" talent training system based on co-construction of R&D institutions. Create a ladder-type talent training path of cognition, curriculum, practice, innovation and application, deepen the integration of production and education, and complement and promote each other, so that students can directly understand the technical needs of industrial development and achieve the goal of training innovative and entrepreneurial talents [9,10].

In the school-enterprise collaborative innovation mechanism and talent training system, the research content of innovation center is formulated according to the needs of industrial technology development, and the dual-regulation talent training mode is constructed on the basis of curriculum system and practice system, giving full play to the advantages of technology innovation center, guided by projects and achievements, with interdisciplinary and integrated characteristics.

(1) Jointly Building Open Innovation Platform and Creating Innovation Practice Environment

Traditional curriculum-based tutorial system makes the training process of students limited by the innovative resources of tutors. Tutors with many projects and good resources can bring better practical application opportunities to students. On the contrary, students often get less innovative resources and lack practical application experience. Based on R&D platforms such as provincial technological innovation centers, this paper constructs a project-based talent training mode and innovation system. The innovation center is jointly established by schools and enterprises, and establishes a sharing mechanism of talents, technology, instruments and facilities, and innovation achievements. The director is responsible for the center as a whole,

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and the central office is responsible for the formulation and management of project plans. All projects share the resource advantages of the innovation center, and an innovation system based on innovation center, project-oriented and innovation resource sharing is constructed.

The Innovation Center is guided by the research and development of new technologies, guiding students to practice curriculum theory through research and development, and jointly setting up diversified advanced innovative teaching modes; Introduce enterprise tutors, jointly develop project management mode with high industry standards, and jointly formulate project performance evaluation and quality assurance mechanism; Through in-depth cooperation between schools and enterprises and joint undertaking of scientific and technological projects, the problems of students' narrow topic selection, low conception and unclear performance output have been solved. Innovation center has become a communication bridge between enterprises and universities, and the actual technical needs of enterprises have been organically integrated with the teaching and scientific research activities of universities, so that students have the opportunity to participate in the actual R&D project process and understand the development trends of industrial technology.

(2) Leading by Applied Research, Building Innovation Collaboration Mechanism

The teaching system of colleges and universities is mainly based on theoretical courses, but there are natural defects in the cultivation of practical application courses due to objective conditions. The industry-university-research platform, such as Innovation Center, is an innovative practice platform with interdisciplinary, interdisciplinary and deep integration of schools and enterprises. R&D projects are put forward based on the actual technical needs of industrial development. Taking projects as carriers as practical links is targeted and oriented, which changes the existing closed school-running mode, can effectively bridge the generation gap between enterprises and universities, and realizes a collaborative innovative talent training system with applied research as the leading factor and deepening theoretical course learning.

The Innovation Center explores the open school-running mode of school-enterprise cooperation, which communicates with social economy, integrates with enterprises, and combines with enterprise technology research and development to form a set of school-enterprise collaborative sustainable development mechanism suitable for engineering specialty construction and enterprise development. Adhere to the market-oriented and keep up with the development trend of industry technology; Under the guidance of the leading thought of "innovation and industrialization" of industry-university cooperation, we will gather the advantages of both sides to overcome the common and key core technical problems in the industry; Through cross-collaboration, production-education combination, resources such as cutting-edge technology, excellent technical talents and mature R&D management mode mastered by enterprises will be introduced into schools, which will not only help solve the practical technical difficulties of enterprises, but also significantly improve the personnel training level and scientific research and innovation ability of colleges and universities, and build a new educational ecology of co-construction, sharing, interaction and interconnection.

(3) Promoting the Transformation of Scientific and Technological Achievements Guided by Innovative Achievements

The Innovation Center has established an innovation mechanism of "technical problems-innovative R&D-achievement transformation-industrialization", which takes the project as the carrier, the project plan goal as the guide and the project implementation progress as the traction, innovates the organization and management mechanism of university production, study and research and achievement transformation, constructs a collaborative innovation chain of "theoretical research-technological R&D-innovation output-application transformation", and forms a collaborative innovation center with a clear division of labor and

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close cooperation of multidisciplinary scientific research and innovation talents and technical systems.

Engineers with rich experience in engineering R&D and application in the joint industry come to the school for guidance, and students can also go deep into the theoretical knowledge of enterprise practice. In the whole life cycle implementation process of product "conception-design-realization-operation", a circular teaching chain from theoretical study, practical guidance, R&D innovation, application transformation to inquiry learning is established, design activities run through the whole process of practical teaching, the teaching plan of "work-study combination" is worked out, the curriculum system based on working process is developed, and the position of on-campus and off-campus training bases in work-study combination teaching is constructed and improved, so that the cultivation of practical ability is continuous.

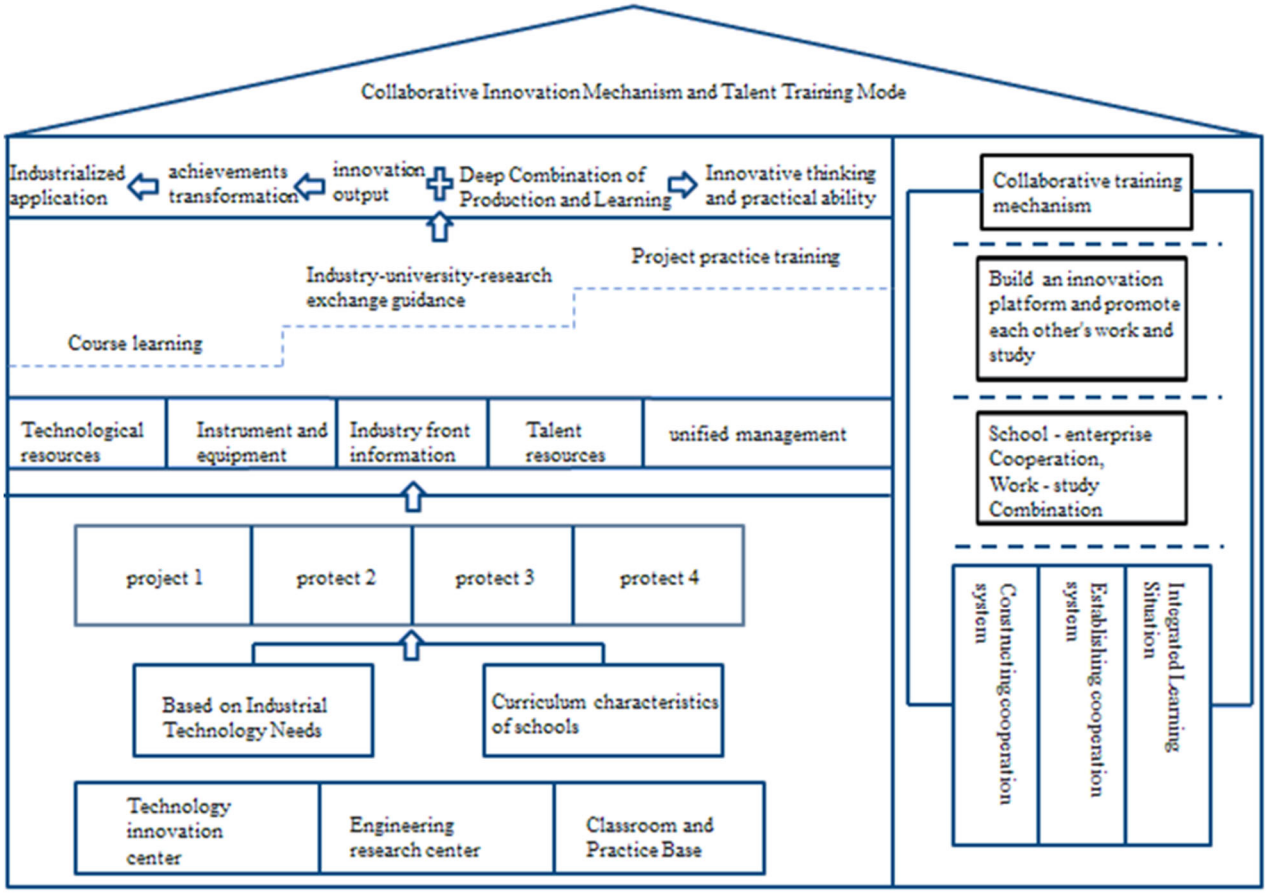

Figure 1. Pattern of Innovative Talent Training in Innovation Center

4. Conclusion

According to China's national conditions, regional economic and social development and the current situation of practical education in colleges and universities, this topic makes full use of the educational resources of industries and enterprises through work-study combination and school-enterprise cooperation, promotes the integration of industry technology, engineering experience and education according to the development trend of industries, and deeply reforms college teaching to make them complement each other. After two years' operation and management, the Innovation Center has achieved remarkable innovation results. Facing the practical engineering of photovoltaic industry, relying on R&D and study groups, it enables students to acquire knowledge, learn knowledge and apply knowledge in practical innovation

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exchange, and constructs a multi-channel, multi-level and multi-mode comprehensive training system of students' knowledge system, practical ability and quality structure, which provides a beneficial exploration for the further promotion of school-enterprise cooperation in higher education.

The effective operation of the deep integration of production and education depends on a good policy environment and a long-term mechanism of cooperation. Building an ecological system of personnel training that is co-constructed, shared and interconnected is the focus of the deep integration of schools and enterprises in the future. In the future, the innovation center will be based on the major strategic needs of the country, increase the intensity of theoretical research and basic research, and rely on the key and common problems in the development of photovoltaic equipment industry to do a good job in vertical excavation of school education and horizontal application of enterprise cooperation, and broaden students' horizons and ideas; Promote the construction of innovative talents training mode, stimulate the enthusiasm and innovation vitality of universities, students, enterprises and teaching system in school-enterprise cooperation, and lay a solid foundation for training applied talents and compound talents.

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