

Research on the practical path of cultivating compound innovative talents under the mode of industry-university-research cooperation

Wang Yan¹, Chen Li¹, Kong Jierui², Ding Lu¹, Tang Yue³, Fan Wenyan³,
Shu Qingshan³

¹School of Environment and Resources, Southwest University of Science and Technology, Mianyang, Sichuan, 621010, China

²School of Marxism, Southwest University of Science and Technology, Mianyang, Sichuan, 621010, China

³School of National Defense Science and Technology, Southwest University of Science and Technology, Mianyang, Sichuan, 621010, China

Abstract: At present, the mode of industry-university-research cooperation in China is not perfect, and the training path of compound innovative talents is not perfect, so it is necessary for colleges and universities to change the previous single form of cooperation and correct the wrong orientation of "emphasizing theory over practice" and "emphasizing scientific research over teaching and research". Improve the traditional talent training model, optimize the coupling mechanism of innovative personnel training, establish layers of in-depth industry-university-research cooperation model, and pay attention to the integration of science and education and the integration of teaching and research To establish an all-around, whole-process, multi-angle and multi-level education mechanism to provide strong talent support for promoting the progress of China's scientific and technological level.

Keywords: Compound innovative talents; Colleges and universities; the mode of industry-university-research cooperation

1. Introduction

Nowadays, China has entered the stage of innovative development. Responding to the innovation driven development strategy and cultivating compound innovative talents have become the subject of the times. At this stage, our University actively responds to the national strategy and establishes the industry-university-research cooperation mode to provide a solid guarantee for the cultivation of compound innovative talents in the new era. The mode of industry-university-research cooperation refers to building a three-way circulation channel of "talent resources" based on the tripartite platform of professional discipline platform, enterprise practice and innovation platform and scientific research resource institute platform in the University and in accordance with the principles of co construction, sharing and win-win. Colleges and universities and scientific research institutes have knowledge and technology and are the main force of innovation. Colleges and universities strengthen the research and innovation of basic theories, and scientific research institutes strengthen the research and development of key technologies. Enterprises are the final destination of innovation and promote the aggregation of high-quality innovation resources to enterprises. ^[1]For colleges and universities, the industry-university-research cooperation model is conducive to strengthening students' basic theory, innovative spirit and practical ability. It is an important measure for colleges and universities to comprehensively improve the level of scientific research, cultivate innovative development talents and strengthen the ability to serve the society. At present, there are still problems and defects in the talent training mode and assessment and evaluation system of colleges and universities in China. The training path of compound innovative talents under the mode of industry-university-research cooperation needs to be improved. Under the background of new engineering, our University actively optimizes the production, study and research mode, meets the requirements of the times driven by social innovation and industrial transformation and upgrading, deeply promotes the structural reform of education supply side, constantly innovates the production, study and research mode, responds to the national innovation driven development strategy, and provides strong talent support for promoting the progress of China's scientific and technological level.

2. Problems existing in talent training in colleges and universities

Taking Southwest University of science and technology as an example, this paper issues a questionnaire to students, deeply analyzes the training path of compound innovative talents under the mode of industry-university-research cooperation, and summarizes the main problems existing in the training of compound innovative talents in Colleges and universities.

2.1 There is wrong guidance in the assessment and evaluation system

The assessment system at this stage has the wrong orientation of "emphasizing theory and neglecting practice" and "emphasizing scientific research and neglecting teaching and research". Teachers' teaching methods and methods mainly focus on the construction of "the first classroom". Most colleges and universities do not update the teaching content in time and prefer theoretical teaching. Students' practical operation ability and practical ability have not been systematically and scientifically cultivated and developed. It has greatly affected the integration and construction of high-level innovative talent training system, and it is difficult to cultivate innovative talents.

2.2 There are defects in the mechanism of talent training mode

At present, some colleges and universities still follow the traditional teaching and education mode, the renewal of professional teaching in Colleges and universities is slow, teachers focus on imparting theoretical knowledge, the categories of extracurricular teaching management mode are messy, lack of scientific thinking and construction, students have few opportunities for scientific research exploration, it is difficult to implement scientific research practice, and there are some problems in the complete and stable operation of the training mechanism of compound innovative talents, Ignoring the cultivation of students' thinking and exploration ability, students' ability to solve complex problems is insufficient.

2.3 Students' practical innovation ability is generally low

The long-term neglect of the construction of the "second classroom" leads to the disconnection between the theoretical knowledge learned by students and practical activities. Students seriously lack hands-on practical experience in the activities of the "second classroom". Students do not have a deep understanding of innovation and cannot form a good sense of innovation. Most students have a high level of theoretical knowledge and weak practical experience; Strong theoretical innovation ability and insufficient practical innovation ability. The fixed and rigid theoretical curriculum leads to the disconnection between the skills acquired by students and social needs to a certain extent. Even if the graduation internship is arranged in the summer, the knowledge and skills learned by students cannot be applied in practice, with little effect. In addition, in practice, the graduation theory accounts for a large proportion of the total credits, resulting in the low efficiency of innovative practice education in Colleges and universities.

3. Significance of cultivating compound talents of industry, university and research

3.1 Innovate educational ideas and improve teaching methods

Under the mode of industry-university-research cooperation, the cultivation of compound innovative talents can innovate teachers' educational ideas, innovate teaching methods, promote the structural reform of education supply side, guide students to take the initiative to conduct in-depth thinking on the knowledge learned in the classroom, and carry out in-depth theoretical exploration and innovative research on the basis of consolidating the advantageous path of traditional talent cultivation, Urge the coordinated development of students' theoretical knowledge and practical ability, and help the integration and construction of high-level innovative talent training system.

3.2 Extend the extracurricular system and optimize the operation mechanism

The cultivation of compound innovative talents under the mode of industry-university-research cooperation extends the cultivation of College Students' comprehensive quality from the classroom system to the extracurricular system. Through the close connection between industry, schools and scientific research institutes, students' disordered extracurricular activities are changed into meaningful

practical activities that are conducive to students' development. According to the law of students' talent development and the law of teachers' teaching and educating people, To realize the construction of a complete and stable system of innovative talents training for college students, to form an innovative talent training operation mechanism supported by industry, school and scientific research institutes in class and after class.

3.3 Break the discipline barrier and integrate the school enterprise resources

Through the establishment of the cooperation mode of production, learning and research, the three-way circulation channel of "talent resource" is built based on the professional discipline platform, enterprise practice innovation platform and resource sharing platform in the school. Students should deepen social practice in the process of professional learning, use the knowledge learned to deal with social problems, break the professional discipline barriers, stimulate students' creative and entrepreneurial potential, cross, penetrate and integrate discipline, social practice and industrial development, create a scientific and reasonable human talent training structure, promote the deep integration of teaching and research, and cultivate and adapt to social development according to the needs of enterprises. High level and high quality talents with both theoretical research and practical innovation.

4. The implementation path of the training of compound talents in production, education and research

Taking the environment and resources College of Southwest University of science and technology as an example, by means of deep coupling of internal and external factors of the main body of education, the talent model is innovated. The implementation path of talent training is constructed from three aspects: macro, medium and micro level, and a comprehensive, full process, multi-angle and multi-level education mechanism is established.

4.1 Macro level: Design of cooperation structure of production, learning and research of composite innovative talents

Taking the school of environment and resources of Southwest University of science and technology as an example, it is one of the oldest schools in the school. The college integrates educational resources, establishes a student working team with instructors and class tutors as the main, and the work committee, student party members and student cadres as the auxiliary, and promotes the whole staff working mechanism of "teachers all participate, alumni are widely integrated and parents cooperate", We will open up a new pattern of all staff education, and set up a plan for the cooperation structure of production, learning and research of the composite innovative talents into four levels:

Resource level: through combing resources by three parties of production, learning and research, jointly build resource sharing platform, integrate resources from industries, schools and scientific research institutions, and establish cooperation on the basis of resource sharing and mutual benefit and win-win results.

Cooperation layer: through multi-party cooperation, dynamic reorganization of human resources, material resources, etc., the cooperation agreement on production, learning and research is reached, cooperation projects of schools, enterprises and scientific research institutions are established, ^[2] build internal and external training bases and joint venues for Industry university research joint site.

Application layer: through the dynamic utilization of resources and the specific implementation of the training process of compound innovative talents through industry-university-research cooperation, complete the specific work of project design and implementation, curriculum guidance, textbook compilation, resource sharing, project practice and so on.

Feedback layer: summarize the project progress and completion through multi-party cooperation, collect students' opinions and modify the current mode.

Through the cooperation structure divided into four levels, sort out and improve the student training scheme and curriculum system, implement the training of innovative talents in all aspects of students' study and life, reasonably divide the labor and perform their duties, establish an all-round, whole process, multi angle and multi-level education mechanism, and realize the construction of a complete and stable college student innovative talent training system.

4.2 Meso level - path planning of innovative talent training under the mode of industry-university-research

In recent years, focusing on the national key strategic needs, the school of environment and resources of Southwest University of science and technology has actively innovated the talent training path of industry-university-research mode, consolidated the existing advantageous disciplines, constantly explored emerging disciplines, realized the seamless connection between the industrial chain and the advantageous discipline chain, and actively adapted to the new situation of industrial transformation and upgrading.

4.2.1 Adhere to the development idea of "foresight, cross integration, internal and external cohesion and improving the mechanism"

Adhere to the development idea of cultivating compound high-end innovative talents. One is "far sighted". Closely focusing on the national strategies of self-reliance and self-improvement in high-level science and technology, double carbon, energy security, healthy China and so on, closely combined with the economic and social development of Sichuan, seize the opportunity, take the initiative, develop in a staggered manner, take basic research as the root, take the needs of directors as the traction, further focus on interdisciplinary direction, and expand horizontally and vertically to basic research, creative technology and achievement transformation. Explore new scientific and technological fields and new forms of innovation through interdisciplinary construction. The second is "cross integration". Further focus on discipline areas, promote discipline intersection and integration, accelerate the formation of the "fist effect" of discipline construction, fully promote the development of basic disciplines in urgent need, and actively prepare for the establishment of energy storage technology specialty. Third, we need "internal and external cohesion". We should not only repair the "internal strength", but also take advantage of the "external force", promote the cooperation between interdisciplinary and industrial circles, actively tap and flexibly introduce high-level talents as the "leader" of interdisciplinary cross platform, and speed up the construction of a first-class scientific research talent team supporting the construction of interdisciplinary cross research platform. Fourth, we should "improve the mechanism". Improve the organizational structure and operating mechanism, accelerate the separate listing of postgraduate joint training and enrollment indicators on interdisciplinary and cross platform, promote the cooperation with director units from "three ones" to "three two", and pool forces to continue to cultivate high-end innovative talents for the development of national defense and military industrial units and industries in Mianyang.

4.2.2 Establish the target stage of "interest training, skill training, special training and innovation training"

The school of environment and resources of Southwest University of science and technology takes interest training, skill training, special training and innovation training as four important stages in the training process of compound talents under the mode of production, study and research. All cooperation under the mode of production, study and research is based on the goal of student-oriented and cultivating compound innovative talents. In the first year of University, by holding lectures and carrying out scientific and technological innovation exhibitions, students can deepen their understanding of the current situation of social and industrial development, broaden their horizons, and pay attention to the Enlightenment of students' innovation consciousness and the cultivation of students' interest in scientific research. In the second year of the University, we will carry out the construction of "three qualified" team, add enterprise tutors and scientific research tutors on the basis of professional tutors, and guide students' all-round development in an all-round way. At the same time, carry out practical training in primary school, create a practical platform for students, focus on investigating students' knowledge transformation ability, and focus on strengthening the cultivation of students' skills. In the third year of the University, guide students to carry out special innovation in discipline technology, strengthen internal cooperation among students, encourage students to widely participate in discipline and professional competitions, and strengthen the special training of students. In the fourth year of the University, the innovative thinking course summarizes the past innovative experience, encourages students to release innovative products, strengthens the cultivation of students' innovative ability, and plans the cultivation path of innovative talents under the production, University and research mode based on students.

4.3 Micro level -- Research on the specific mode of industry-university-research cooperation

From the micro level, under the industry-university-research mode, the university needs to actively contact enterprises and scientific research platforms to implement the cooperation and summarize the

law through specific projects. Colleges and universities and scientific research institutes have knowledge and technology and are the main force of innovation. Colleges and universities should strengthen the research and innovation of basic theories, pay attention to the cultivation of talents and the transfer of knowledge, and scientific research institutes should strengthen the research and development of key technologies. Enterprises are the final destination of innovation. They should promote the gathering of high-quality innovation resources to enterprises and play a leading role in meeting major needs. It plays an important role in driving the development of the industry. In the process of establishing the model, the industry-university-research institute should earnestly consider the realization of the common objectives of the three parties and establish the input and harvest model of the three parties.

4.3.1 Industry-university-research cooperation to build a practical teaching center base

The practical teaching center is jointly invested by schools and enterprises. On the basis of industry-university-research cooperation, it uses the sites of industries and scientific research institutions or the sites developed and invested by them for practical teaching. The practice teaching center is oriented to students, and industry and scientific research institutions provide a series of supporting services for the school, such as the display of the latest scientific and technological achievements, cutting-edge technical support, software training, project practice and so on. Relying on the practical teaching base, enrich students' extracurricular practical activities, strengthen students' theoretical application ability, stimulate students' innovative potential, and provide a practical platform for the cultivation of compound innovative talents.

4.3.2 Establishment of environmental protection public welfare cooperation platform under industry university research cooperation

The school of environment and resources of Southwest University of science and technology has established a long-term cooperative relationship with the "green dynamic future" environmental public welfare crowdfunding platform. Through school enterprise cooperation, the College of environment and resources can use the enterprise platform to carry out a variety of environmental protection innovation activities for college students, such as the national environmental protection innovation cultivation plan for college students, the youth volunteer activity for environmental protection and public welfare of college students (Qingzhi activity), and the popular science publicity and education of green environmental protection and public welfare knowledge. Relying on the Internet, improve students' participation in environmental protection, promote the popularization and promotion of environmental protection awareness, and enhance students' environmental protection innovation ability.

4.3.3 Build an innovation and entrepreneurship studio under the mode of industry-university-research cooperation

Innovation and entrepreneurship is the core goal of cultivating compound innovative talents under the mode of industry-university-research cooperation. Strengthen the in-depth cooperation among industries, schools and scientific research institutions, give full play to the role of teachers as "intermediaries" and cultivate compound innovative talents. The University cooperates with small and medium-sized production enterprises and scientific research institutions to build an industry-university-research cooperation studio. The university provides venues and construction space, and a teacher is responsible for the connection of industry-university-research. Enterprises and scientific research institutions sign cooperation plans with innovation and entrepreneurship studios according to the actual production needs, subcontract innovation and entrepreneurship projects to studios, and provide financial support for the operation of studios. Students participate in the work of the studio, get the exercise of the actual project, and get a certain degree of work subsidy, so as to cultivate innovative and entrepreneurial talents.

4.3.4 Building a "three-teacher" teaching team

The college integrates educational resources, reforms the educational curriculum system and educational organization form, innovates the talent training mode, and forms a "three in one" talent training system. On the basis of having professional tutors in the school, increase enterprise tutors and scientific research tutors, and establish a "three-teacher" teaching team. Enterprise tutors teach practical courses, and scientific research tutors bring more cutting-edge production knowledge to students, so that students can master more standardized development processes in the process of classroom learning. By pooling various educational and teaching resources of the school, enterprise and department, dynamically adjust the training direction, specialty setting and discipline structure, strengthen the cooperation between enterprise tutors, scientific research tutors and school tutors, and jointly discuss topics such as curriculum construction, textbook compilation, project research and development, etc. The three mentors had in-

depth exchanges, optimized classified training conditions and strengthened collaborative education.

5. Conclusion

The mode of industry-university-research cooperation is the only way to respond to the national innovation driven development strategy, improve the talent training strength of colleges and universities, and build a high-level university.^[3]In today's era, colleges and universities must change the past single cooperation form, correct the wrong guidance of "emphasizing theory, practice", "emphasizing scientific research and teaching research", improving the traditional talent training mode, improving students' practical innovation ability, combining the three-party platforms of schools, enterprises and scientific research institutes, and establishing deep-seated cooperation mode of production, learning and research, and in accordance with the construction, sharing, and cooperation of the two parties. Based on the win-win principle, strengthen the integration of science and education and the integration of teaching and research, and constantly optimize the coupling mechanism of cultivating compound innovative talents under the mode of industry-university-research cooperation, so as to form an innovative talent training operation mechanism supported by in class and out of class, industry, schools and scientific research institutes, and provide strong talent support for promoting the progress of China's scientific and technological level.

Acknowledgements

Quality education reform of Southwest University of science and technology in 2021. Project name: training practice of compound innovative talents under the mode of industry-university-research cooperation -- Taking the school of environment and resources as an example, project number: 21szjg13;

References

- [1] Liu Jihong (2016). *Motivation and path of innovation of University LED industry university research cooperation mode under the new normal [J]. Jianghai journal, no.05,pp. 203-208.*
- [2] Zeng Wenying, Zeng Donghai, Wu Jijun(2013). *Research on the training mode of creative talents based on the dual subject of school and enterprise [J]. Value engineering, vol.32, no.09,pp. 252-254 DOI:10.14018/j.cnki. cn13-1085/n.2013.09.124.*
- [3] Zong Yongling, Heng Yaofu (2014). *Strengthen the construction of industry university research cooperation platform and cultivate high-quality applied talents [J]. Journal of Hubei University of science and technology, vol.34 , no.06,pp.115-116 DOI:10.16751/j.cnki. hbkj. 2014.06.053.*