

Research on the Mode of Cultivating Students' Innovation Ability Based on the Idea of Integration of Production, Teaching and Research

Li Bao^{1,2,a,*}, Jing Luo^{1,b}, Hui Jiang^{1,2,c}, Li Ming^{1,d}, Fengxia Xu^{1,e}, Ziqi Liu^{1,f},
He Zhao^{1,g}, Qingjie Tan^{1,h}

¹School of Mechanical and Electrical Engineering, Qiqihar University, Qiqihar, China

²Qizhong CNC Equipment Co., Ltd, Qiqihar, China

^alwjxs2019@163.com, ^blj1439468925@163.com, ^cJhui11088@126.com, ^d3087923557@qq.com,
^e723368691@qq.com, ^f2541109444@qq.com, ^g592258047@qq.com, ^htxjie1122@126.com

*Corresponding author

Abstract: In order to reform the ability training mode, the new mode of cultivating students was put forward based on the concept of integration of production, teaching and research. A school enterprise cooperative education base was built, the interdisciplinary integration was improved and the construction of the teaching staff was strengthened. Multi-dimensional teaching was carried out, and a tutor type scientific research team was built. The purpose of the mode is that the students constantly improved their practical ability while mastering professional knowledge, so as to comprehensively improve their innovation ability.

Keywords: Integration of production; teaching and research; Engineering students; The innovation ability

1. Introduction

The integration of production, teaching and research is an important mode of training specialized talents in the field of higher education. With the development of a new round of industrial revolution, collaborative education has become a consensus^[1]. The meaning of industry-teaching-research integration is the deep integration of schools, research institutions and enterprises under the red line of scientific and technological project research. Through the integration of resources based on the advantages of both sides, synergistic effects are generated, and the research ability of teachers and enterprises is strengthened. In recent years, in mechanical and electrical engineering of Qiqihar university (hereinafter referred to as the "school") and intelligent machine tool industry leading enterprises- QiZhong CNC Equipment Co., Ltd has deepened the cooperation in science, production, technology and personnel, improved the level and innovation ability of science and technology teachers, become the basic force for training innovative technical personnel, and built into a think tank for technological innovation and technical services in the field of machine tools in Heilongjiang Province. As a new education model, the integration of production, teaching and research can realize the effective docking of students' theoretical knowledge and practical skills, and improve students' innovation ability.

2. The present situation and deficiency of the integration of production, teaching and research

2.1 The transition from the spontaneous to the conscious stage

In recent years, the mode awareness of the integration of industry, education and research has been constantly strengthened, which is mainly reflected in the following aspects: first, the two sides are brought together through the project as the red line. The integration of the two sides has entered a normal stage, more professionals, teachers actively participate in the cultivation of consciousness, forming a virtuous circle; second, the team consciousness is also continuing to improve. Enhance the competitiveness and quality of external technical level through cross-professional team complementation. Third, the organization of cooperative enterprises and staff to the school part-time

training situation gradually stable. Bringing new technologies and projects to students and teachers, demonstrating new trends in industrial development.

2.2 The transition from the awareness stage to the action stage

To speed up the research production, the integration between the school implemented a series of reforms and measures, revised more scientific, more flexible scientific research projects and funds management arrangements, enter the policy that gives priority to with machine tool science and technology, from the cognitive level slowly turned to behavior, one is to accelerate the scientific and technological innovation and technical cooperation, for teachers to provide technical services, strengthen policy and administrative guidance. This is policy support for the project. Second, a small number of teachers have the ability to undertake scientific and technological projects of enterprises, and all of them have participated in and cooperated with each other in an all-round way. Third, teamwork and multi-party integration have become the mainstream of scientific research and technology services.

2.3 The two sides of the integration of schools and enterprises with different ideas

The cultivation of innovative talents is inseparable from the close cooperation between schools and enterprises. There is a mismatch between the demand side of industry and the supply side of university talent. In other words, the reality requires universities to cultivate high-quality talents who can adapt to the new needs of economy and society, have practical professional skills and understand the real engineering scene according to the characteristics of engineering discipline. However, the phenomenon of "stratification of enterprise and university education" still exists, and the problem of integration has not been fundamentally and effectively solved. Therefore, it is urgent to realize the substantial and deep integration of the production-education integration mode, construct the subject collaborative cognitive relationship, so as to construct the comprehensive innovation ability training mode suitable for engineering students.

The key to cultivating creative talent is collaboration. In the process of education, it is not advisable to leave out the demand and only focus on the employment but ignore the education, which will not benefit the progress of schools and enterprises. Schools and enterprises should reach consensus in philosophy, realize the identity of the subject of talent training, and establish a win-win and mutually beneficial system on the basis of cooperation.

2.4 Lack of effective platform

The reason why many school-enterprise cooperative education stays on the surface is that there is no platform supporting mechanism for the integration of industry, teaching and research that can be implemented in depth. The key problem is whether the platform supporting mechanism of the integration of industry, teaching and research can be built with a mutually beneficial system. The education platform based on the integration of industry, teaching and research needs to find out the intersection of the needs of both sides in the platform mechanism so as to mobilize the enthusiasm of both sides, that is, to consistently grasp the mutual needs of both sides can be implemented in depth. The goal is to cultivate talents, realize the mutual cooperation mode of both sides, realize mutual assistance in disciplines, participate in the process of education and production practice, analyze the feasibility of education plan, and cultivate innovative talents through the integrated education platform of production, teaching and research based on the system of mutual benefit.

3. The construction of production, teaching and research integration training mode

It is a comprehensive project to establish the talent development mode of "integration of production, teaching and research" in schools^[2]. The so-called "integration of industry, teaching and research", from the literal meaning of understanding, "industry" refers to "industry", is the general term of all industry combinations. "Teaching" means "education", the purpose is to meet the needs of all walks of life in society. "Research" refers to "scientific research". In the process of student education, school education and scientific research are closely related, that is, colleges and universities follow the standards and requirements of the industry to develop talent training programs to achieve the educational goals of students. At the same time, the integration of industry, education and scientific research has also had a great impact on the way and method of professional personnel training. It is the integration of

educational processes with industrial and scientific activities, facilitating the process of adapting students to the conditions of the future professional field. From the perspective of the social system, the "integration of production, teaching and research" is an "ecosystem" composed of enterprises, universities and students. Only by identifying the key points in the "integration" can the "big factory" of the university produce "products" that meet the needs of the society and create high-quality talents. The training model of the integration of production, teaching and research is shown in Figure 1.

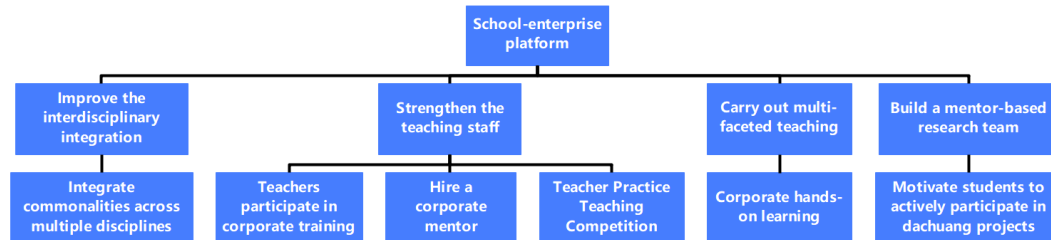


Figure 1: Talent training model

3.1 Building a school-enterprise cooperative education base

Currently, the outstanding education training program for engineers and the construction of new engineering are all intended to improve the engineering innovation ability of engineering students. Ability and knowledge are not the same, and the cultivation of ability also needs the company of practice teaching. Relying on the current collaborative innovation Center of intelligent Manufacturing Industrialization of our university and Heilongjiang Intelligent Machine Tool Research Institute, this study can cooperate with engineering majors to carry out practical dual cultivation, and cultivate students' innovation ability in an all-round way.

3.2 Improving interdisciplinary integration

The development of contemporary science and technology increasingly presents the trend of multi-discipline intercrossing, interpenetration and integration, and discipline intercrossing has become the era characteristic of contemporary scientific development [3]. Therefore, in the process of cultivating innovative talents, we should pay more attention to the cultivation of students' cross-disciplinary adaptability. The curriculum is an important tool to cultivate talents, which should reflect the synergy between different disciplines. The professional curriculum system plays an important role in the cultivation of students. As the practitioners of running schools, schools should closely grasp the industry trends, should keep pace with The Times, real-time optimization of courses, to meet the trend of industry development. Analyze the teaching content to ensure that students can obtain the guarantee of relevant educational resources; secondly, we should learn from the successful experience of other universities, integrate the advantages of the joint development of mechanical engineering, control engineering and material engineering, and form a cross-disciplinary talent training model. It is absolutely necessary to develop students' innovative ability as the starting point and train excellent engineers as the ultimate goal.

3.3 Strengthening the construction of teaching staff

The cooperative education based on the integration of production, teaching and research has obvious advantages. Compared with individual training, it strengthens the team of educators who cultivate talents, and teachers are the top priority in the whole link. Education team teacher strength optimization, school and enterprise teachers jointly education, naturally cultivate a high-quality talent team. So that it can broaden the students' learning knowledge, to obtain a real sense of comprehensive training. In practice, both sides can communicate and learn from each other. School can send education workers to participate in the enterprise internal training school, to broaden the university instructor's knowledge, companies can send to carry out the engineering practice teaching guidance enterprise technical personnel form the strength of cultivating students' comprehensive quality, school teachers by university-enterprise joint training or guidance, promote the development of "double type" teachers. Colleges and universities should formulate corresponding systems to maintain the enthusiasm of educators, constantly improve the overall level of teachers, and form a high-level education team. With the development of the theory of production-education integration and coordination, the requirements

on the level of educators are becoming more and more strict. Therefore, we must stick to the strategy of "bringing in" and "going global". Firstly, educators with rich practical experience in production and research and development ability should be appointed to participate in the teaching process. Colleges and universities should improve the structure and input system of teachers, strengthen the construction of "double-qualified" teachers, flexibly introduce high-level experts and technical personnel from enterprises, and cultivate comprehensive talents with rich theoretical knowledge and practical ability. These experts and educators can serve as course teaching, practical teaching counselors, visiting professors, etc. And improve the pay system to make teachers more proactive. In order to improve the practical ability of teachers, colleges and universities should establish a teacher development center, which is responsible for the management and training of teachers. Colleges and universities can also regularly arrange outside enterprise experts to hold theme lectures, teachers practice teaching competitions, invite industry elites and experienced educators to give guidance, teacher rotation training, etc. Rotational training can be carried out in enterprises that have cooperative relations with colleges and universities, and colleges and universities should keep informed of the information in the process of teacher training. After the training, the assessment results are closely related to the professional title assessment and incentive policies.

3.4 Developing multidirectional and three-dimensional teaching

Multidisciplinary engineering major is a new teaching orientation at present, with a wide range of courses and integration of engineering, mathematics, natural science and other disciplines. In addition, engineering students' innovation ability needs to be focused on practice^[4]. At the same time, relying on Heilongjiang Provincial Intelligent Manufacturing Equipment industrialization collaborative innovation platform and Heilongjiang Intelligent Machine Tool Research Institute and other units, the School of Mechanical and Electrical Engineering of Qiqihar University continues to implement the integrated learning mode of production, teaching and research in order to promote school-enterprise joint training of students' innovation ability and practical level. Our enterprises with the industry to develop innovative engineering talent such as qi heavy CNC collaborative culture, through the cooperation between colleges and join in colleges and universities of engineering education course construction, create innovative engineering and technical personnel training scheme, let the students into the enterprise unit communicate learning, allowing students to have a real experience in the engineering practice, In order to realize the university-enterprise co-construction "student-enterprise" three win-win mode.

3.5 Relying on enterprise projects and research topics, a research team based on the supervision system is built

From the aspects of team formation, guidance distribution, communication and feedback, assessment and evaluation, and the application of scientific research achievements, through the organic combination of the project team teachers' scientific research projects and innovation projects, the research team of the tutorial system is built. Based on the big innovation project, a scientific research group will be formed. Each group is composed of five people and equipped with an instructor. A good reporting system was formed, and a regular meeting was held in each field to communicate the problems encountered in the project. The specific direction of the next research was obtained through discussion, and the project leader and members were assessed respectively, so as to fully mobilize the enthusiasm of each student to participate in the project. By carrying out intra-group learning and regular communication, students can be informed of the latest and most cutting-edge discipline dynamics, which can lay a solid theoretical foundation for later innovation activities, encourage students to enter the project for scientific research activities and cultivate their innovation ability and responsibility.

4. Production, teaching and research integration construction achievements

4.1 Improving the cooperative education mechanism and building a practical education platform

Relying on the provincial first-class majors and key majors, it has established the provincial "Intelligent Equipment Industry College." and been successfully selected into the "school-enterprise Cooperation Double Hundred Plan". The provincial intelligent manufacturing equipment industrialization collaborative innovation base and Qiqihar intelligent manufacturing innovation

platform have been built to lay the platform foundation for student training in our college. In the perspective of industry-teaching-research collaboration, to adapt to the new situation, a series of teaching and practice reforms have been carried out, and the research results have been exchanged at various conferences at the national, provincial and university levels and brother colleges. The phased results have been applied in five institutions, leading the development of the regional talent training model, promoting the reform of the talent training system in colleges and universities, and continuously providing a solid guarantee for innovative talents for the development of the manufacturing industry.

4.2 Highlighting the educational status of mass entrepreneurship and innovation, and taking multiple measures to implement the educational function of practice

Personnel training mode and mechanism innovation, innovation entrepreneurship education to join the whole process of innovative talent training, the professional basic course, professional core courses and penetration in the direction of professional class innovation entrepreneurship education content, and according to the professional post and the future development direction of the additional innovative entrepreneurial project, promote the students to grow up, create innovative talent training system. Adhere to the principle of teaching and research integration and school-enterprise cooperation, relying on the open experimental platform of the college, all-round implementation of practical education function. We should strengthen the standardized management of experimental teaching, practice training, curriculum design and graduation project (thesis), carry out comprehensive reform of practical teaching and establish a new system of practical teaching suitable for the cultivation of innovative talents.

The college pays attention to cultivating students' innovative consciousness, cultivating students' innovative ability, stimulating students' creativity, and encouraging students to apply their professional knowledge to innovation and entrepreneurship. We should integrate social responsibility, innovative spirit, entrepreneurial consciousness and entrepreneurial spirit into education and teaching, and integrate self-innovation, entrepreneurship and personal growth with national development and progress. Actively promote double gen education, design experiments, practice, practice, graduation design and system construction of double gen education integration training, set up in order to "the talent as the center, to learn and use, interactive" production, teaching and research as the core system of practice education, pay attention to play to the open laboratory and student second classroom in the double gen education personnel training. Vigorously promote the reform of "people-oriented" innovative and entrepreneurial teaching methods, vigorously carry out discussion, heuristic and participatory teaching. Teachers are encouraged to carry out research on innovation and entrepreneurship education, and to produce representative projects, papers and results.

Invite experts to evaluate the project roadshow of the entrepreneurial team, and select qualified teams with typical demonstration and leading role to settle in the entrepreneurial park. Adhere to the integration of industry, teaching and research, school-enterprise cooperation, service HeilongJiang development road, take the initiative to integrate into the industry, enterprises, improve the ability to cultivate application-oriented, innovative talents. The number of teachers and students participating in the research and competition of mass entrepreneurship and innovation projects has been increasing year by year. In recent years, more than 280 students from 76 project teams have been trained in innovation and entrepreneurship projects on the above practice platforms. The number and quality of awards have been significantly improved, and the educational mechanism of entrepreneurship and innovation in universities and colleges has been gradually improved, which has effectively stimulated the enthusiasm of teachers and students for entrepreneurship and innovation, and achieved certain achievements in innovation and entrepreneurship education.

The integrated training of production, teaching and research promotes students to serve in the manufacturing industry. In the past three years, manufacturing industry accounts for 76% of the employment direction of mechanical graduates, which has trained many excellent talents for the manufacturing industry. Over the past eight years, the employment rate of mechanical graduates has exceeded 95%. Nearly 100 employers have been investigated, and the satisfaction rate has reached 98%. The quality of graduates has been significantly improved. The quality of graduates has been significantly improved as shown in Figure 2.

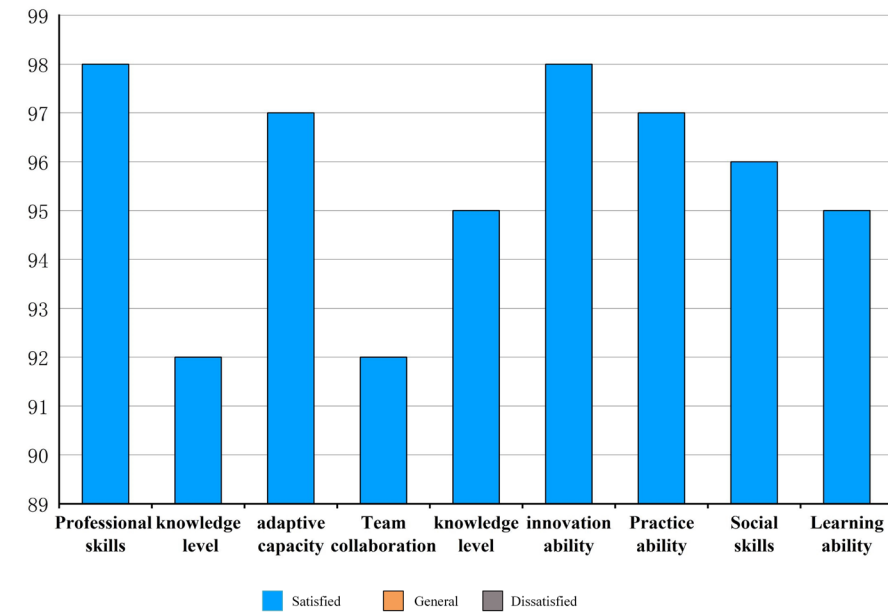


Figure 2: Overall quality of graduates

5. Conclusion

The combination of production, teaching and research has great practical significance and profound influence on many professional developments. Teachers should pay more attention to the integration model of production, teaching and research, explore and understand it constantly, and deepen the effective reform plan of the model of education and research. Mix to produce research enterprise production, teaching, and training of innovation training integration for an organic whole, to cultivate the innovation ability of students, at the same time, by producing research fusion was deepened, with the right combination of enterprise, not only can promote more scientific research achievements, but students can also know more about the market trend and the enterprise demand, between the complementary advantages of resources.

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