

Practice Exploration of School-Enterprise Cooperative Education for Compound Talents Facing New Engineering Construction

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Abstract: Under the background of new engineering construction in the new era, higher requirements are put forward for training composite talents in the mechanical field. In the process of new engineering construction, this paper analyzes the problems existing in the cooperative education of universities and enterprise in local applied colleges and universities. The article fully considers the university's mechanical specialty school-enterprise cooperative education of composite talent training mode. Then from the optimization of the training program, redefinition of training objectives, reform of curriculum system, construction of collaborative teaching staff, and optimization of talent evaluation mechanism were elaborated. It provides a reference for the cooperative education of composite talents under the background of new engineering construction.

1. Introduction

The development of the times and science and technology is accelerating and changing. The industrial structure continues to upgrade. The knowledge of a single discipline and traditional engineering can no longer meet the needs of modern society and solve complex scientific and industrial problems. To proactively respond to the new round of scientific and technological revolution and industrial transformation, the Ministry of Education has actively promoted new engineering construction since 2017. It aims to use intelligent manufacturing, artificial intelligence, cloud computing, robotics, etc., to upgrade traditional mechanical and vehicle engineering professions. Cultivate high-quality composite new engineering talents with practical solid ability, strong innovation ability and international competitiveness [1]. Under the active organization and promotion of the Ministry of Education, the "Fudan Consensus" of major universities has discussed the connotation and characteristics of the new engineering and the path selection of the construction and development of the new engineering [2]. "Day Action" pointed out the new engineering construction action line. Through the "six questions," the development goals of the six critical factors of engineering construction are clarified [3]. The "Beijing Guide" has proposed the guiding opinions

for constructing new engineering. The target requirements are clearly defined [4]. The "trilogy" of new engineering construction has laid the foundation and pointed out the development direction for new engineering education and composite talent training. Integrating the content of new engineering construction into the discipline of construction and personnel training has become the top priority task and focus of attention in various universities.

Under the guidance of new engineering construction, the training of compound talents is based on integrating multiple disciplines. Schools need to integrate the contents of multiple disciplines to cultivate talents with innovative ability and practical solid abilities. The overall educational level of teachers in colleges and universities is higher. The training of talents lays particular stress on the imparting of theoretical knowledge. The company has experienced engineers and more advanced production equipment—which lay particular stress on the cultivation of practical ability. The organic combination of universities and enterprises can improve the quality of compound talent training to meet the requirements of enterprises for talent. Finally, realize the close connection between education and employment. Therefore, cooperative education between universities and enterprises is the key to cultivating compound talents. It is of great significance.

2. Research status

The goal of the construction of the new engineering Department is to cultivate a group of high-quality cross-compound engineering talents with an international vision suitable for China's national conditions and leading industrial development. The requirement for talents is to have a strong engineering science and system thinking ability. Knowledge of other disciplines should also be introduced into the knowledge system of this discipline. Only in this way can we achieve the goal of compound talent training under the new engineering construction. Many scholars have studied the cultivation of compound talents under the background of new engineering construction. Chen Jianzhi [5] proposed to carry out the interdisciplinary development of new engineering disciplines, attach importance to the exchange of academic achievements and strengthen the cooperation between schools and enterprises to achieve the cultivation of composite talents in machinery. Fang Liangfei [6] discussed the current situation of training workers and peasants in the mechanical major and proposed innovative training modes such as optimizing training objectives, curriculum system construction reform, teaching content and teaching method reform, and optimizing curriculum assessment and evaluation mechanism. Chen Xiaoming [7] explored the reform of practical teaching of mechanical majors under the background of new engineering. Because of the problems existing in traditional practice teaching, it is necessary to optimize the talent training program, innovate the training mode of design engineering, strengthen the reform of practice teaching curriculum, and innovate the method of practice teaching. Only in this way can the quality of personnel training be improved. The above studies have carried out a lot of exploration and accumulated rich experience in constructing new engineering.

The composite talents facing the new engineering construction should not only have solid professional theoretical knowledge, but more importantly, they should have practical engineering knowledge and interdisciplinary and systematic thinking. But at present, the practice of mechanical specialty in domestic colleges and universities is still mainly based on basic experiments and verification experiments, lacking inquiry experiments. The equipment/facilities of the engineering practice are old and out of step with The Times. Therefore, it is not enough to cultivate students' engineering practice ability only by relying on school resources under the new engineering background. So universities and enterprises must cooperate in educating people. Give full play to the advantages of both. The purpose is to build a platform for training compound talents. Shi Jiaying [8] pointed out that school-enterprise cooperation in developing curriculum is one of the essential links

in collaborative education. It is proposed that the school and the enterprise should form a leading group. Coordinate various resources to ensure the smooth implementation of cooperative courses. Su Jian [9] proposed the construction plan for the school-enterprise double master studio. It explored the innovative talent training mode of "promoting learning by competition, promoting learning by creation, promoting learning by evidence, and promoting learning by service." Cao Xiuling [10] elaborated on the school-enterprise collaborative education personnel training model from five dimensions of the training program, teaching staff, practice base and evaluation system under the background of new engineering. All the above research has laid a foundation for establishing a school-enterprise cooperative education model for composite talents oriented to constructing new engineering.

3. Analysis of problems in the training of interdisciplinary talents under the construction of new engineering

The "dual subject" mode of school-enterprise integration in our country mainly focuses on directional demand and school-enterprise joint training. Colleges and universities lead the former to organize scientific research teams to provide oriented services for enterprises. The latter is the form adopted by most higher vocational colleges in China. That is, to transport application-oriented technical personnel to enterprises in order class. Order mode, post-internship mode, "3+1" mode, "2.5+1+0.5," and other "dual subject" training modes of production and education cooperation have played a promoting role in the exploration of application-oriented colleges and universities. However, the cooperation as mentioned above mode has also exposed some problems in practice. It mainly includes the following aspects:

(1) The participation of enterprises in realizing talent needs is not enough. They are expressing dissatisfaction with the provision of education. Some applied colleges and universities' talent training programs cannot keep up with the development of modern technology. As a result, the professional teaching content and the development and demand of the manufacturing industry are in an awkward situation of disconnection and fault.

(2) The idea of school-enterprise collaborative education is single. In the past, the cooperative university of university and enterprise is generally the main party. Therefore, colleges and universities only want to introduce enterprises to strengthen students' engineering practice ability but ignore the organic unity of theoretical knowledge and engineering practice. This refers to enterprises not being deeply involved in the college talent training program. Colleges and universities also do not have a deep understanding of enterprises to provide students with projects that can improve the ability of engineering practice. To a certain extent, it separates the efficient unity of theory and practice.

(3) There is too little interaction between the school and the enterprise. Although the school has introduced enterprises, the school only sends students to enterprises, and the enterprises rarely enter the school. Making the two parts independent and not interacting well.

(4) Students' enthusiasm is not high. The work content of the school-enterprise cooperation post is straightforward. The job offer is not attractive. Career prospects are uncertain. As a result, most graduates leave their jobs voluntarily after completing their internship. Therefore, an effective long-term mechanism of compound talent training between schools and enterprises cannot be formed.

(5) Students have a single skill. The training plan of the current order model is formulated according to the production needs of a particular enterprise or industry. It produces students not well qualified for other jobs after leaving the workplace—lack of adequate training in students' professional quality and general skills required for engineering practice. The professional potential is limited, and the development momentum is insufficient.

The school later paid more attention to innovation, combining production, university and research, and interdisciplinary integration of new engineering construction. It has changed the application-oriented colleges and universities to serve the economy and society and become a new way to lead the development of the economy and society. In a society where technological innovation and industrial upgrading are changing so fast, schools and enterprises should establish a composite talent training system that ADAPTS to it. Reform of personnel training, curriculum, practice and other links is a subject for schools and enterprises to consider.

4. Exploration of school-enterprise collaborative education training mode for composite talents under the construction of new engineering

Under the background of new engineering construction, the school-enterprise collaborative education training mode for compound talents should consider the high requirements for the training of compound talents brought about by new technologies, new industries and new forms in the current society. It is also necessary to consider the responsibilities that universities and enterprises can do within the scope of their abilities in collaborative education. Under the new engineering construction, the mechanical major of our school has carried out the school-enterprise cooperative education model. The teaching staff of school-enterprise cooperative education has been established. The talent evaluation mechanism has been optimized—student-centered use of school and enterprise resources and complementary advantages. Through the collaborative education platform built by the school and the enterprise, students are forced to learn in the school and accept the joint training of the enterprise. Then students continue to practice in enterprises in the form of talents. In this way, they become compound talents. A long-term and effective school-enterprise cooperative education mechanism has been formed.

4.1 School-enterprise collaborative optimization of composite talent training program

Under the background of new engineering construction, what is needed is interdisciplinary talents with strong cross-professional ability and a high degree of interdisciplinary knowledge integration. In the enterprise, some job requirements are inconsistent. Enterprises need both versatile compound talents and personalized scientific and technological talents. Based on this, the school cooperates with Suzhou Ruikeda Connection System Co., LTD. Involve enterprise engineers in the development of talent training plans. Subsequently, the school's professional course teachers and enterprise engineers jointly give lessons to students. Senior enterprise engineers cultivate students' ability to integrate engineering practice and subject knowledge. For some positions, different requirements to give full play to the credit system. We can ensure that what students learn can be applied to practice. Stimulate students' interest in learning. It is suitable for students to better adapt to the enterprise.

4.2 Redefine talent training objectives.

Under the background of new engineering construction, the mechanical major of the university should redefine its talent training objectives to meet the requirements of the information industry in the new era. The traditional school-enterprise cooperative education mode only focuses on students' learning and practice of product design and manufacturing technology. However, in today's society, products are no longer designed, manufactured and other elements, but also electronic, information and other elements. Therefore, it is necessary to change from the single cultivation of mechanical design and manufacturing talents to the cultivation of innovative ability, interdisciplinary ability, marketing ability, English application ability and other compound talents. They also can collaborate

across disciplines. Students can collaborate with engineers in other fields to complete complex engineering tasks. Also, students should have the ability to use English. They can compete internationally. This shows that the goal of talent training must be in line with social and economic development and change. The opinions of enterprises should be entirely accepted when redefining the goal of talent training. Only in this way can the goal of talent training meet social development needs.

4.3 Curriculum system innovation reform

School-enterprise collaborative education is not only a practice place for the school provided by the enterprise but also gives full play to the advantages of the enterprise's engineering practice. Many first-line design, production, manufacturing and other engineering cases are interspersed in the course. On the one hand, we take the initiative to jointly hire enterprise engineers to create integrated courses. Rich engineering practice cases are included in the course and updated in real-time.

On the other hand, improve the proportion of practical courses. The traditional cooperative education of schools and enterprise often focuses on theory. Engineering practice links are too few. Under the background of new engineering construction, it is necessary to cultivate students' strong engineering practice abilities. Therefore, enterprise projects can be introduced for actual practice—individualized development of students in a project-driven manner.

4.4 Build a team of teachers for school-enterprise collaborative education

The teaching staff of school-enterprise cooperative education is the key to cultivating composite machinery talents. Teachers' teaching level will determine the quality of personnel training to a certain extent. School teachers should consider their ethics and pay attention to their practical ability when constructing a team of cooperative education teachers. It is best to choose dual teachers with industry backgrounds as course teaching. School teachers are encouraged to take temporary job training in the front line of enterprises. For enterprise engineering, it is necessary to fully consider its ethics, education, professional titles, etc. It can provide more learning resources for students. In addition, schools and enterprises must fully interact. School teachers can understand what students do in business practice. Business engineering can help understand what students learn in school. Corporate engineers should also be involved in all aspects of the student training process. For example, students participate in professional competitions and students' graduation projects. School teachers also participate in practical projects enterprises arrange to improve their engineering practice ability.

4.5 Optimize the talent evaluation mechanism

The evaluation of compound talents for new engineering construction is firstly diversified. The main body of talent evaluation is mostly government departments and schools. The socialization of talent evaluation is not sufficient. The construction of a compound talent evaluation mechanism should encourage enterprise engineers to participate in student evaluation. Evaluation is carried out practically. To help students more clearly understand their gaps in enterprise positions. Lay a good foundation for the improvement of skills. And then define the goal of future efforts. Secondly, build a dynamic talent evaluation mechanism. To cope with the development of The Times, enterprises will change their requirements for compound talents. At the same time, students' knowledge will change, and their potential will be stimulated from entering school to graduation. Skills and levels of innovation are displayed differently at different stages. The evaluation of compound talents should be a dynamic process. Comprehensively evaluate students' innovation and practical ability to promote

students' self-development.

5. Practical results

The school and Suzhou Rukeda Connection System Co., LTD. started school-enterprise cooperation education. Several interdisciplinary talents have been cultivated. Good results have been achieved.

(1) Students get good results in discipline competitions. Under the guidance of the mentors of both the school and the enterprise, the students of the school-enterprise cooperation class will participate in the China College Students Mechanical Engineering Innovation and Creativity Competition (national Class A competition) in 2022 and win three national second prizes and two third prizes. In addition, students wrote and applied for more than ten patents based on the competition.

(2) High-quality employment. School-enterprise collaborative education class enrolled 37 people. Finally, the company signed 30 people. All are engaged in technical positions. Through the return visit, it is found that the satisfaction of enterprises on talents and students on employment has reached 100%.

Through practice, it has been proved that the students cultivated by this model can fully meet the employment requirements of enterprises.

6. Conclusion

Under the background of new engineering, this paper takes the training of mechanical majors in our school as an example. The university and enterprise have explored how to cultivate interdisciplinary talents with innovative ability, practical solid ability and interdisciplinary integration. We should give full play to the advantages of schools and enterprises and actively interact. We will improve the collaborative education mechanism. We will train more talented people who can adapt to economic and social development.

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