

Practical Research on the Cooperative Cultivation of "Primary, Master and Industrial" Multidimensional School and Enterprise in Engineering Education of Mechanical Applied Talents

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Abstract—Based on a large number of analysis about the data of the employment needs of electromechanical enterprises, this paper uses the data of the teaching process and the teaching effect data, and uses the results of the data analysis and comparison to guide the teaching process, and reconstructs the multi-dimensional teaching model. This teaching model includes the training of mechanical engineers, the education method of undergraduate master's degree students, and the practice of various training methods for engineering master students. The research results help to promote the improvement of workers 'ability to work in industrial enterprises and promote the improvement of students' and employees 'skills. Therefore, this topic is used to build an education model of "undergraduate, engineering master, new craftsman," overall management, build school-enterprise cooperation to cultivate talents, and establish a training model of the same specifications for graduates. However, the multi-dimensional teaching model adopted in the process of cultivation is beneficial to expanding the source of students, improving the quality of cultivation, and reducing the cost of cultivation. It has high practical value and theoretical research value.

Keywords—*mechanical engineering and application type; multi-dimensional teaching; data analysis; teaching method reform*

I. INTRODUCTION

In order to reform and practice the effective methods of multi-level enrollment overall planning training in comprehensive universities, coordinate the full-time undergraduate course of mechanical engineering with the full-time master of industrial design engineering, the non-full-time master's of industrial design engineering, education for higher education, progression education coordinates with the needs of enterprises. Through the

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construction of school-enterprise collaborative education model, enterprises gradually increase the ratio of participating in running a school; comprehensively construct the multi-dimensional model of high-level personnel training of mechanical engineering and school-enterprise collaborative education. Through the same specifications, multi-mode training for blue-collar workers to formulate and approve the work plan. The research results of this subject will greatly optimize the quality of mechanical education, improve undergraduate education and professional master's training mode, accelerate the progress of discipline construction, promote enterprises to participate in teaching reform, and promote collaborative education and supporting reform[1-2].

II. ESTABLISHMENT OF A MULTI-TEACHING DIMENSION CONSTRUCTION TARGET MODEL

This research project is carried out in the mechanical engineering, mechanical and electrical engineering, automotive service, automation professional training, the development of a variety of ways to enroll students, a variety of levels of training in specialized mechanical engineering practice. In the training mode of reform and innovation, according to the specialties of the students, the classification education and practice links in different directions are carried out in the following directions: (1) School-enterprise cooperation in granting professional qualifications to mechanical engineers; (2) "junior college to bachelor degree, bachelor degree to master degree, master degree to doctorate degree"; (3) Carry out professional master's training in two ways: full-time and part-time, and the enrollment integration and education and teaching reform of the postgraduate students in the recruitment of graduate students; (4) To those students who have no desire for further education and strong practical ability, we should start the education of "new craftsmen".(5) The establishment of a variety of assessment modes, through the school experimental

class assessment, corporate performance assessment and participation in different periods of competition as a student practice class of the extended assessment method. (6) Conducting teacher training for multi-dimensional teaching tasks, aiming at the requirements of different levels of training on personnel training mode and improving students' innovative spirit and practical ability, carry out school-enterprise cooperation to improve the level of teachers cooperation to improve the level of teachers, policies to guide teachers in-depth training of engineers in enterprises, Invite corporate technicians as corporate mentor for students, part-time engineering master's work experience in enterprises as a training program to develop the key content written into the personal training plan. On the basis of the above-mentioned reform of the multi-dimensional practice teaching model constructed, the research on multi-faceted teaching behaviors is carried out; the apprenticeship system is promoted, and widens the paths for enterprises to participate in higher education institutions [3-4].

III. RESEARCH ON THE PATH OF MULTI-DIMENSIONAL TRAINING OF APPLIED TALENTS

Through the talent training programs at different levels and at different levels, In the process of teaching, we will flexibly change the content of school-enterprise collaborative education, and carry out various ways to cultivate the path and practice the multi-dimensional teaching mode. This research and the practice work, in the teaching behavior development process pays attention to the monitoring teaching effect data, combined with data comparison feedback, successfully seeks the high efficiency realization path, and through the concrete teaching link verification, has proved this teaching method feasibility and the practice effect.

A. *According to the different levels of students, the same size, multi-model training path*

(1) According to the discipline characteristics of mechanical and electrical engineering related specialties, we should carry out undergraduate education and postgraduate education at different levels of training mode, and establish a close connection with the industrial chain and innovation chain. Through the different social division of labor after the employment of students, statistics and mining of human resources data are carried out, the use of data mining feedback information to guide graduates in the future personal development of the appropriate disciplines. Cultivate "highly educated new engineering" and "highly educated new craftsmen" talents [5].

(2) Practice the innovation of enrollment and employment of demand-oriented engineering master training. Accelerate the reform of education "streamline administration, delegate Power, strengthen regulation", compare graduate employment quality data with undergraduate entrance data horizontally, and pay attention to the feedback application of data mining results of talent demand prediction. Expanding the enrollment of undergraduate students to further study in the school preparatory training, and recruit student's directional training of enterprise workers. Taking the employer's professional ability evaluation as one of the quality evaluation of school-enterprise collaborative education, the market supply

and demand ratio and employment quality are used as the basis for setting and adjusting the teaching content, and the training scale and training method are determined[6].

(3) Carry out the engineering practice teaching of productive practice training in the regular teaching link of undergraduate education, and perfect the scattered practice training system of students' internship to enterprises as the temporary employment of enterprises. We should encourage the introduction of enterprises, the introduction of schools, the integration of schools and enterprises, etc. Integrate schools with enterprises, so as to attract high-tech technology-based enterprises and schools to jointly build productive training bases, promote the transformation of the role of teacher education, and change the concept of teacher teaching into the concept of instructive teaching behavior.

(4) The practice of school-enterprise collaborative innovation and the transformation path of scientific research achievements, with the school's research and evaluation of faculty and staff as incentives, institutions of higher learning encourage the scientific research achievements of frontline workers in teaching and research to transform into the production of cooperative enterprises and promote the cooperation between schools and enterprises.establish a research team that teachers and students work together to promote the improvement of students' quality; Collaboration around engineering practice relevant industry key technologies, core crafts and commonality issues, accelerate the transformation of basic research results into industrial technology.The master's thesis of engineering can be the work content and technical practice of the service enterprise. The school cooperates with the industry enterprises and formulates the transformation plan of the results[7]

(5) Utilizing the "off-site training" of the school-enterprise cooperation industrial design engineering professional training path. Encourage the combination of part-time students' own work as students' internship training content, with the enterprise to assist in training, to ensure that targeted students enjoy reasonable remuneration and other legitimate rights and interests. At present, most of the students enrolled for professional master's degree are from individual behaviors, and many enterprises do not support the employees to apply for the examination. The main reason is that during the study period, due to the training mode and the management method of the students, the employees who read the book will delay their work. In response to this problem,, we should take practice-oriented training mode innovation, take salary and factory award as the reference point of comprehensive evaluation at the end of the term, support and encourage the directional students to work hard, improve the scientific research evaluation system of postgraduate training, and take the achievement transformation as the important content of project conclusion and talent training quality evaluation[8].

B. *Research and practice on diversity of examination methods of learning effect*

Combine undergraduate production practice, graduation practice with factory production process in to one. The content of professional master's enterprise work is similar to that of tutor's guidance content. Curriculum assessment takes the form

of debriefings, summarizes the form of papers, scientific and technological inventions, participation in competitions, etc., and implements diversity assessment and learning results.

(1) Guide students to participate in production and write a summary of the evaluation method of the school and enterprise double tutor exchange meeting. According to the different training mode, the assessment can be divided into centralized assessment and the form of remote meeting place coexist. Can be practical work report, factory actual production situation overview, only let students understand the enterprise, understand the market, the future can be good designers, good staff.

(2) The practice is based on the training mode of school-enterprise deep integration (theory + practice + competition) process assessment skilled talents, through the practice of school-enterprise joint mechanical engineer, lead students to participate in various practical professional skills competition, in order to improve students' professional knowledge, innovative skills and entrepreneurial abilities.

(3) Research on the Teaching Model of Engineering Practice Ability as the Focus of Assessment, the use of school-school joint, school-enterprise joint, cross-touch, collaborative construction to train students to independently use what they have learned, comprehensive analysis and solve practical problems of engineering practice. Teachers and students participate in engineering practice together, and schools and enterprises collaborate to develop skill competitions, apply new and innovative talents, and build high-quality talents [9].

IV. THE TEACHING CASE OF MULTI-MODE TRAINING AND THE ANALYSIS OF TEACHING REFORM EFFECT

The course education of undergraduate students during the school period is used as the basis for their technical and ability improvement; it's the accumulation of intellectual resources during undergraduate studies. After the teaching process enters the practice process, carry out the mechanical engineer training project import, the entrance education course import, and participate in the enterprise technology reform and innovation competition is participated. Construct a three-dimensional "multi-dimensional teaching mode" of "this master's work" and "competition interaction."

A. *Advantages of real-time feedback of main teaching cases in constructing multi-dimensional teaching model*

(1) The object of this teaching mode is the specialty with high requirement of practical teaching. The members of the subject group have been responsible for making relevant decision-making of teaching management for many years, supervising the implementation of teaching reform, teaching practice on the front line. The work content is consistent with the content of teaching reform, constituting a feedback mechanism, strong execution and good effect of teaching reform.

(2) According to the different professional titles and scientific research directions, teachers should guide students in groups in each teaching link, guide students in different directions to participate in various competitions at all levels,

and carry out the assessment of practice link in a procedural and staged way. Relevant teachers are personally experienced in each teaching link of the process assessment, which constitutes the feedback information source and executor of the real-time teaching mode construction.

(3) The policy level of teaching reform research is appropriate to the learning style of the teaching environment. The members of the research group have undertaken many teaching research projects for many years, participated in the implementation of teaching reform and teaching style construction, the teaching environment and the supporting funds of teaching reform research have guaranteed the multi-mode training, constituting cost feedback.

(4) Constructing the technical cooperation platform for enterprises to participate in teaching, using the practical aspects of teaching to introduce the technology needed by the cooperative enterprise, the teaching content and the work content of the cooperative enterprise are closely integrated. And closely integrate with the work content, students who enter the practice chain are out of production in the enterprise, and the content of the work is the content of the practice link education. The obtained materials and hands-on ability are summarized into texts and practical experience, and then used for graduation design and writing thesis. In this process, the mechanism of close cooperation between universities and enterprises to cultivate talents is formed, and the cooperation between practice bases is deepened[10].

(5) In the process of part-time engineering master's training, the company's tutors are guided by the "studio" in the school, and the work opportunities and rewards are obtained in the way of employees participating in production practice outside the school, that is, the business incubator, so that graduate students can directly participate in the enterprise. All aspects of the operation can directly contact the operation mode, technical process and the latest technological developments of related industries, and can make the university service and the local economy[11].

(6) The company's technology-related projects will carry out special scientific research work through "school-enterprise cooperation", conduct science and technology competition competitions within the school, and carry out academic competitions in student activities, etc., bringing the needs of enterprises into teaching, especially graduate students participate in various technical update links such as the design and operation of enterprise projects, and expand the practice bases of universities to provide technical support to enterprises.

B. *Teaching Effect Data*

After the implementation of the collaborative multi-dimensional training model, the teaching effect of the "Mechanical Major" in the School of Mechanical and Electrical Engineering of the project team has been significantly improved, as shown in Fig. 1, by comparing the horizontal data of the different years of student learning and work efficiency in the collaborative education mode and the non-cooperative education mode, fed back the conclusion: students in Institutions involved in the teaching of three-dimensional training, the mastery of technology is better,

participation in scientific research and participation in innovation practice is relatively high. Especially after the multi-dimensional guidance of higher education, the ratio of postgraduate examinations has increased linearly. In 2016, the rate of enrollment was 5.6%, and the rate of enrollment in 2017 was 7.82%. The annual rate of enrollment is 11.83%, and the evaluation of enterprises and teaching units is above excellent.

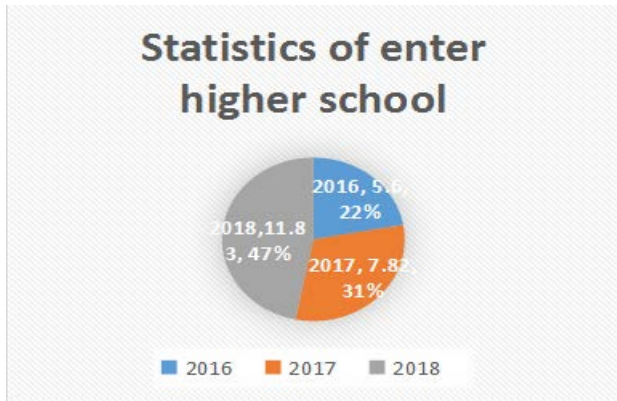


Fig. 1. Statistics of enter higher school chart

The practice link introduces the three-dimensional and multi-dimensional training mode of enterprise work, undergraduate promotion master's degree, master's degree doctor, do not enter higher school new artisan training, students' innovative consciousness and practice spirit, innovation and entrepreneurship and employment ability improvement; Enterprises recruit new workers not simply class training, but the school and the company to cultivate together.

C. Analysis of the effect of information feedback progressively guiding the improvement of teachers' ability in colleges and universities

Research and practice multi-dimensional teaching operation mode, guide the specialty setting of the school, guiding enrollment behavior, guide teachers' teaching behavior, dig out the relationship between the improvement of students' comprehensive quality and the diversity of professional courses, study and develop the relationship between practice comprehensive quality education, progressive analysis ability and innovation ability training, use the analysis results to guide teachers' level improvement, guide curriculum reform, reform the implementation process of the renewal of educational philosophy in colleges and universities.

(1) Improve the engineering ability and teaching quality of university teachers, cultivate their modern engineering education concept, and urge them to participate in the research of the teaching reform method of the current research on the cultivation of mechanics and graduate students [12].

(2) Real-time monitoring and feedback of teaching effect data. The quality of teaching and scientific research of university teachers directly affects the teaching effect, the comprehensive quality of teachers affects the students' comprehensive quality education, and teachers' teaching workload affects the relationship between students' follow-up employment and their ability to enter a higher school.

V. CONCLUSION

There are planned and step-by-step implementation of multi-dimensional "primary, master and industrial", "school, enterprise, research" closely combined teaching mode, with the colleges and universities of higher education as the technical center point to contact the school-enterprise education model update cooperation Units, contact the college to undergraduate students, contact the master student of engineering, and expand the horizontal coverage of teaching. Further integrate the quality resources of school-enterprise, improve the awareness of enterprises in the training institutions, and improve the quality of enrollment. Practice this cooperation path, take the various assessment results and evaluation results of schools and enterprises as the performance points of each other's performance, strengthen the construction of enterprise technology centers and university technology innovation platforms, encourage enterprises and universities to jointly build training methods, and not delay the employment of enterprises, Delaying students' comprehensive assessment results does not affect the assessment of scholarships, does not affect the personal income of part-time personnel and supports the personal development of students. The three-dimensional multi-dimensional teaching practice method is effective and efficient.

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