



Innovation and Research on “Two-Three-Four” Education Mode in the Perspective of “Emerging Engineering education” A Case Study of Mechanical Design, Manufacturing and Automation in Huzhou University

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Abstract. In view of the gap between the demand for talents and the fostering of talents for the development of “Emerging Engineering Education”, Based on the current situation of Mechanical Design, Manufacturing and Automation specialty (Mechanism for short) in Huzhou University, and the characteristics of local industry, this paper puts forward the mode of “Two” cooperation education, “Three” promotion curriculum system and “Four” integration teaching model of education strategy, and finally focused on the “Two-Three-Four” education model of the connotation, implementation and measures. This mode can provide some references for local application-oriented universities to further improve the quality of innovative talents under the demand of the construction of “Emerging Engineering Education”.

Keywords: Emerging Engineering Education · Educational Model · School-enterprise Cooperation · Project-based Teaching · Integration of Theory and Practice

1 Introduction

The construction of “Emerging Engineering Education” is the initiative action, the initiative plan for the future and the “Stroke of progress” responding to the trend of the times of higher education based on the present in China. Since February 2017, the Ministry of Education has been actively promoting the construction of new engineering, successively forming the “Fudan University Consensus”, “Tianda University Action” and “Beijing University Guidelines” [1–3], and issuing the “Notice on the Development of Emerging Engineering Education Research and Practice” and “Notice on the Recommendation of Emerging Engineering Education Research and Practice Projects”, making every effort to explore the formation of China’s model and experience of leading global engineering education. This series of measures constantly promote the “Emerging Engineering Education” construction pace.

Based on the “Emerging Engineering Education” talent fostering requirements, new models of education emerged, such as school-enterprise cooperation, integration of industry and education, integration of industry and learning [4–7]. However, there are still many problems in the training of “Emerging Engineering Education” talents. Each school must seek the suitable talent education model and the strategy according to its own situation.

2 Difficult Position of Talents Fostering

Although some attempts have been made in School-enterprise cooperation education field, the depth of cooperation is far from enough, and there are still many problems, as follows:

- (1) The mode of school-enterprise cooperation is single and the depth of cooperation is not enough.

The combination of some universities and enterprises in China has formed the pattern of the integration of production, teaching and research, but it is still in the stage of spontaneous combination, and the depth of cooperation is not enough, however, enterprises seldom participate in the process of cultivating innovative talents in colleges and universities [4, 5].

- (2) The talents fostering pattern is single, the theory and the practice are disjointed.

At present, most colleges and universities have a single mode of talents fostering, the students generally have strong theoretical analysis ability and weak practical operation ability, which leads to students can only do some idle theorizing while facing complex engineering problems after entering the society, but can not meet the actual needs of enterprises [6, 7].

- (3) The teaching mode is backward, the teaching content is out of touch with the times.

Under the background of “Emerging Engineering Education”, the fostering of talents should be closely combined with the social needs, but now most colleges and universities only teach the obsolete basic theoretical knowledge, which is difficult to realize the change from discipline-oriented to industry-oriented [8, 9].

3 The Educational Strategy

“Emerging Engineering Education Talents” are high-quality, compound talents who can meet the needs of new industries and new economy in the future, and should have stronger practical ability, innovation ability and international competitiveness [10, 11]. Relying on Huzhou’s three pillar industries of environmental protection, logistics and elevators, and combined with the school and major’s talents fostering objectives, Huzhou University proposed a “Two-Three-Four” education model.

“Two” refers to “Two Cooperation”, it refers to the practical teaching cooperation and theoretical teaching cooperation between school and enterprise. In order to improve the quality of “Emerging Engineering Education” talent fostering, our school and Local

well-known Enterprises launched cooperation and exploration in the theoretical teaching mode, teaching content and teaching methods.

“Three” means “Three promotion”, it includes Enterprise Project Promotion, Subject Competition Project Promotion and Teacher Research Project Promotion. It is an important guarantee to foster qualified “Emerging Engineering Education” talents by introducing enterprise project, subject competition project and teacher scientific research project into the matched curriculum and establishing “Three” promotion curriculum system.

“Four” refers to “Four integration”, which is the integration of online and offline, theory and practice, curriculum and ideology, soft ability and hard ability, it is the innovation of curriculum teaching model. Online and offline integration can realize personalized learning, theory and practice integration can cultivate students’ knowledge application ability, curriculum and ideology integration is an important guarantee to improve students’ ideological and political awareness, and hard ability and soft ability is a high integration of students’ skills and qualities.

4 The Implementation Plan and Measures

4.1 The Implementation Plan of the “Two-Three-Four” Educational Model

First: School-enterprise cooperation to establish the practice cooperation teaching platform and the theory cooperation teaching platform.

In recent years, School of engineering of Huzhou University has cooperated with many famous local enterprises to set up practice teaching base. On this basis, the school and the enterprise has deepened the cooperation, the theoretical teaching platform is established, the theory cooperation education model is carried out. The cooperation of knowledge and industry is realized by the cooperation of experts from schools and enterprises, the establishment of curriculum system, the discussion of teaching contents and the teaching of a course.

Second: School-enterprise cooperation to establish “Three” promotion curriculum system based on project teaching method.

First of all, University and enterprise cooperate to establish the “Project case set” which is matched the needs of “Emerging Engineering Education” talents fostering. Then, the “Three” promoting curriculum system is established by choosing suitable courses from each semester which have high degree matching with the projects. Next, combined with the characteristics of the program and the course, according to the construction of “Emerging Engineering Education”, the teaching content is updated, the teaching method is reformed, the teaching process is optimized, and the students’ ability is improved through project teaching. Finally, the whole process advanced education model based on project is realized in the theoretical teaching of professional courses.

Third: School-enterprise cooperation to achieve the “Four” integration of teaching mode.

Based on MOOC or SPOC courses to carry out online and offline integrated teaching, using online courses to provide students with rich self-learning and expand learning resources to achieve personalized learning. In the course of teaching, the project-based teaching method is adopted, and the project task is completed while learning the theoretical knowledge through the form of “Learning and doing”, thus, the knowledge goal and

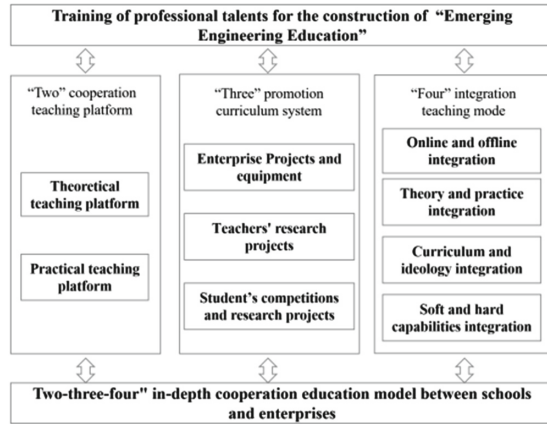


Fig. 1. Model frame

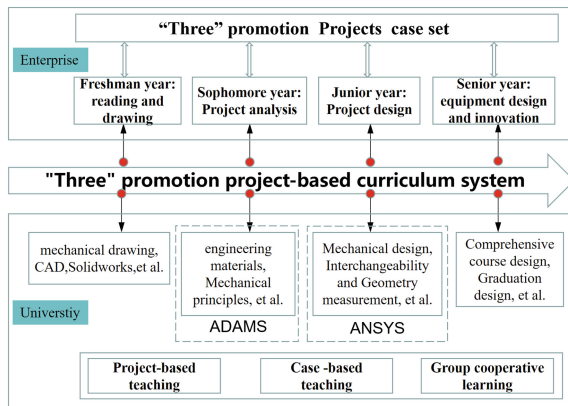


Fig. 2. “Three” promotion curriculum system

the ability goal can be achieved. At the same time, in order to help students form a correct outlook on life and values, the corporate culture, production cases and labor model stories are introduced in the courses. In the key courses, follow the Enterprise Project Management Method, the students’ professional quality is cultivated through group cooperation, role-playing, task-driven methods. Finally the knowledge, ability, professional quality and ideology education objectives can be achieved efficiently (Fig. 1).

4.2 The Specific Measures of the “Two-Three-Four” Educational Model

(1) The implementation method of “Two” cooperative education mode

First: According to the needs of enterprises, combined with professional education certification, the development of The Times and the needs of students’ long-term development, the school and enterprise jointly negotiate and revise the training program.

Second: Under the framework of talent training program, the curriculum team and relevant enterprise experts discuss and determine the syllabus of professional courses according to the needs of the enterprise and the requirements of the school.

Third: Open the “One lesson, one division, one expert” model, in order to ensure the teaching effect, the enterprise experts teaching times must be more than once in each course. In addition, enterprise experts should have senior engineer title or above.

(2) The construction measures of “Three” promotion curriculum system

First: the construction of “Three” promotion project theme set. “Three” promotion project theme set is established by selecting enterprise projects, products, equipment and cases, combining with teachers’ scientific research projects and students’ award-winning projects. In order to deepen the cooperation between schools and enterprises in theory teaching, the curriculum team sorted out and selected 8 local enterprise projects based on the characteristics of Huzhou’s local economy and the training needs of mechanism professionals, see Table 1 for details. These 8 projects have been deeply embedded in the course of teaching.

Second: the establishment of “Three” promotion curriculum system. According to the knowledge structure and system of professional courses, at least one course with a high degree of project-matching is selected into the “Three” promoting curriculum system every semester. The course chosen in Freshman year are “Mechanical drawing” and “computer-aided design”, the course chosen in sophomore year are “Engineering materials”, “Mechanical principles”, “Electrical control and PLC”, the course chosen in junior year are “Mechanical design”, “Interchangeability and Geometry measurement” and “The basic of mechanical manufacturing”, while the course chosen in senior year are “Comprehensive course design” and “Graduation design”.

Third: the determine of the course teaching task and teaching goal. During their freshman year, in conjunction with projects, students are trained to read and draw mechanical devices. In sophomore year, we focus on developing students’ ability to analyze the structural characteristics, motion and dynamics of mechanical assembly. In the third year,

Table 1. Enterprise projects

Item	Project	Enterprise type
1	Kitchen waste screw conveyor	Environmental protection enterprises
2	Construction garbage belt conveyor	
3	Recyclable garbage sorting conveyor	
4	Lifting device for sightseeing elevator	Elevator enterprises
5	Escalator main transmission device	
6	Express carton pallet conveyor	Logistics enterprises
7	Design of parallel load shifter	
8	Full electric pipe bending machine single shaft design	Special equipment enterprise

the mechanical equipment structure design ability becomes the final goal of the course teaching; The senior year, students’ ability to solve complex problems and innovate are cultivated.

“Three” promotion curriculum system is shown in Fig. 2.

(3) The promotion method of “Four” integration teaching mode

First: Online and offline integration. Before class, students’ ability of active learning and independent learning can be cultivated through learning online resources by themselves. In the class, the students’ ability to solve problems is trained through case analysis, group discussion and other ways. After class, the teaching goal of the course is guaranteed to reach a high level through reinforcement and advanced learning based on the offline and offline integration.

Second: Theory and practice integration. Combined with the project, the project-based teaching method which combines theory and practice is adopted in each course of the curriculum system. For example, in “Mechanical drawing” and “Computer-aided design” courses, parts and assembly drawings of equipment in projects are introduced into the curriculum to help students understand the structure of equipment. In “Applied mechanics” and “Mechanical principles” courses, the kinematic and dynamic analysis of components in equipment is considered a major project assignment. In the course of “Mechanical design” and “Interchangeability and geometric measurement”, project-based teaching based on the design process of equipment is carried out to cultivate students’ design ability. In the graduation practice and graduation project, the innovative design and transformation of equipment in the project is taken as the topic so as to realize the training of “Emerging Engineering Education” talents’ analytical design and innovative ability.

Third: Curriculum and ideology integration. The teaching team excavates the ideological and political elements contained in each course, and establishes ideological and political cases set organically combined with the corporate culture, corporate cases, model character stories, craftsmen of great powers, etc. The case sets of all courses are combined to form the ideological and political case set of the curriculum system after integration. In combination with teaching content and ideological and political cases, the course lecturer introduces cases in the explanation of knowledge, and cultivates students’ ideological and political consciousness imperceptibly through case analysis, thus achieving the integration of curriculum and ideology.

Fourth: Soft ability and hard ability integration. In the implementation process of the project-based teaching method of enterprise internship, summer practice and theoretical courses, the enterprise project management method is adopted, and the students form a project team to realize the organic integration of the hard ability of mechanical professional skills and the soft ability of professional ethics, teamwork and service consciousness of the students through role playing, task driven and other ways.

5 Conclusion

Combining with the training objectives of professional talents and the characteristics of local industries, and facing the existing problems in the training of institutional professional talents in our university at the present stage, the paper focuses on the “Two-Three-Four” school-enterprise in-depth collaborative education mode. This paper explores the school-enterprise collaboration mode in theoretical teaching, and expounds the necessity and importance of school-enterprise collaborative theoretical teaching from the aspects of education mode, curriculum system and teaching mode. Otherwise, this paper mainly introduces the measures of in-depth integration of school-enterprise collaborative theory teaching, and elaborates the construction methods of “three” promoting curriculum system and the contents of “four” integration teaching mode. The “Two-Three-Four” school-enterprise cooperative education mode has certain applicability, it can improve the quality of talent training in local colleges and universities to a certain extent, and promote the service of local economy and local development. It can be extended to applied colleges in other places.

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