

Exploration and Standardization Discussion of School-Enterprise Cooperative Education Model

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Abstract. In the exploration and practice of the model of “school-enterprise cooperative education”, there is still a pain point: how to fully integrate industry and education in resources, information and other aspects, so that the school’s talent “export” can better meet the enterprise’s entrance needs. Dalian Neusoft University of Information and Alpine Automotive Electronics have conducted a beneficial exploration in the field of “school-enterprise cooperative education” in the form of joint customized training classes. The customized class is guided by the needs of enterprises. The dual tutor system consisting of university teachers and enterprise engineers as well as the product development process and management mechanism of enterprises is applied. The operating environment of enterprises is restored in the school and through real project experience realizing the transition from students to talents. The article also boldly put forward discussions, how to standardize this customized training mode and the promotion of universalization, and alleviate the contradiction between supply and demand of talents from the whole society level.

Introduction

In recent years, the technology and industry hotspots have changed very fast, especially on the aspects of Internet, Internet of Things, and artificial intelligence. Therefore, the current industrial situation has put forward unprecedented requirements for the engineering practice ability of the talents exported by universities. It is far from enough for graduates to master theoretical knowledge and basic professional skills. Apart from that, more comprehensive practical abilities such as analysis and solution of complex engineering problems, interdisciplinary and systematic thinking, and international perspective are required [1].

In order to cope with such rapid development and change, higher education is doing all kinds of efforts, Such as the adjustment of the curriculum system, the reform of teaching methods, the application of advanced Internet technologies, the implementation of engineering education models, and so on [2,3,4]. However, rarely jumping out of the barriers of the campus, directly focusing on the pain points that do not match the "export" and "entrance". University teaching and enterprise employment are still in isolation. In order to solve this pain point, we must find ways to customize the university outlets according to the enterprise entrance. Universities should also guide enterprises, so that the enterprise entrance can provide adaptation support for the school's exports, adopting enterprise customized training mode, so as to achieve "integration of production and education, collaborative education"[5].

In order to verify the effect of the customized training mode, Dalian Neusoft Institute of Information and Alpine Automotive Electronics Co., Ltd. jointly established a school-enterprise class. A useful exploration of on-demand customized curriculum, corporate classroom management, performance-based performance assessment, etc. In the following, we will first compare and analyze the teaching effects through the case study of the customized class, and then discuss the challenges faced by the customized training model and further conceive how to model the future.

Case Analysis of School-Enterprise Joint Customized Class

The enterprise customization class in this case adopts the dual tutor system consisting of school teachers and enterprise senior engineers. According to the organizational structure, development process and quality management system in the enterprise, the courses are designed to achieve the transition from students to engineers.

In fact, the customized class completely subverts the traditional teaching mode. From curriculum development, teaching content design, teaching implementation to course assessment, they are deeply customized according to the needs of the enterprise. Meanwhile, there is a deep participation of the enterprise.

Enterprise Talent Demand Survey. It is necessary to go into the enterprise and deeply understand the actual requirements for all aspects of talent as well as the potential requirements associated with industry characteristics, corporate culture and future development. In this way, the “export” of the school can be accurately connected with the “entry” of the enterprise. In the early stage of the implementation of this course, the school had visited and surveyed the cooperative enterprise for many times, got the requirements for personnel ability points shown in Table 1.

Table 1 Requirements for Personnel Ability Points in Embedded Software Direction

Ability	Capability requirements
Technology	Solid C language foundation, Linux system, data structure, hardware basic knowledge, and problem-solving ability
Management	Understanding the development process, document capability, quality and cost awareness
Cooperation	Good communication, division of labor and cooperation, responsibility and strict delivery
Others	Communication in foreign languages, international vision and innovation awareness

By comparing 70 capability points of the CDIO competency program [6], this study finds that the ability points required by the enterprise have the corresponding content. In other words, this kind of customized training mode is not in conflict with CDIO [7]. Through the combination of school and enterprise, the abilities required by the company can be found. In this way, it is conducive to shaping the talents who meet the requirements of different industries.

Curriculum Development. The courses selected in this case are the training courses for seniors. In order to achieve a rapid transition from students to employees, the best way to design the course is to simulate the scene of the enterprise project development as much as possible and to integrate the real project throughout the course. Indeed, the key capabilities can be strengthened by combining the concerns of the enterprise. Besides, the human resources and engineers of the company need to participate in, negotiate, and determine these contents. In the syllabus and content development, the following two points are the focus.

Enterprise-like Classroom Management. In the implementation stage of the customized class, the way of the enterprise is simulated from classroom organization, project development process, and quality management. Meanwhile, the enterprise instructors are regularly invited to participate in the technical guidance and review of the results, which allows students to accept the challenges of corporate life before they enter the enterprise.

(1) The teaching process implements enterprise management and the classroom becomes the development site of the enterprise. The main role of the teacher is to organize the classroom according to the operation way of the enterprise.

(2) In general engineering education, the development process of the project is not very detailed and strict. Nonetheless, ensuring the quality of the final product is inseparable from the strict development process division and management.

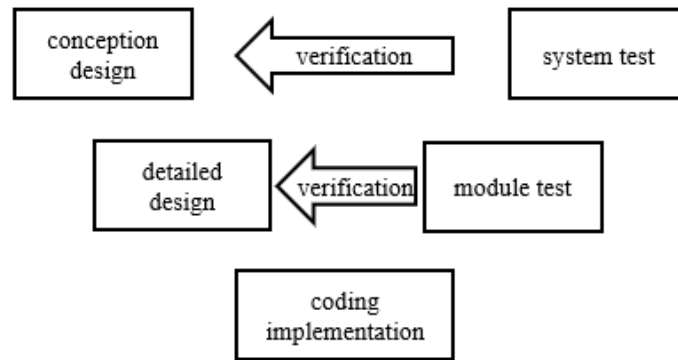


Figure 1 "V" shape development stage

The development process and the requirements of the project used in this case are formulated with reference to the process of the enterprise software project. The development phase is divided into five aspects: conception design, detailed design, coding implementation, module test and system test, as shown in Figure 1. It is a typical "V" shape development stage diagram. If put two test links into one category, it is very similar to the four phases of CDIO.

(3) Although quality management is the most contemptuous part in school teaching, it is the most important part in the company. Therefore, in this case, a review meeting is held for the results of each development phase. At the same time, corporate instructors are invited to participate in. In addition, it is necessary to introduce quality management methods such as problem management tables and bug management tables. It is also important to regularly track and check the problem-solving status of each group.

Performance-based Curriculum Assessment. In this case, the course assessment is classified into formative assessment and final assessment. Meanwhile, the process and results are taken into account. Based on the school's curriculum assessment system, the enterprise's assessment mechanism is used for reference and the assessment points are set according to the curriculum's target ability points. Additionally, the teachers, enterprise personnel and student team leaders participate in the assessment to make the assessment results relatively fair and equitable.

Formative assessment consists of attendance and discipline performance, outcome quality and teamwork. Final assessment, which adopts public defense method, can be divided into works display and publication of defense. To be specific, the judges first observe the experience works, score the works, and then further evaluate the quality of the work as well as the team members' ability and the development process.

The Effect of School-Enterprise Joint Customized Class

This customized class has made a smooth transition from college students to social talents. The students have designed products that meet enterprise standards, the course practice outcomes as shown in Figure 2. Moreover, the teaching effect has been recognized and highly evaluated by students, enterprises and schools. Besides, it has achieved a win-win situation among the three parties.

(1) The teaching effect is more in line with the requirements of enterprises. As shown in Figure 3 radar chart, compared with ordinary training classes, students have significantly improved in solving complex problems, strengthening cooperation, familiarizing themselves with business management processes and broadening their horizons. They have advanced the internship time in the enterprise to the pre-graduation period, which has enhanced the competitiveness of employment.



Figure 2 Student Course Practice Outcomes

(2) The company has realized the planned customization of talents, which can select more suitable talents, shorten the internal training cycle, and reduce the cost of talent recruitment and training. At the same time, enterprises know more about the schools, which can strengthen other aspects of school-enterprise cooperation.

(3) The school has promoted the effective employment rate, played a good role in serving the regional economy. Moreover the school gains a better understanding of industry development and business needs, which is also helpful for updating the teaching content of other courses. Apart from that, school-enterprise cooperation not only drives school research and innovation but also enhances the reputation and influence of the school.

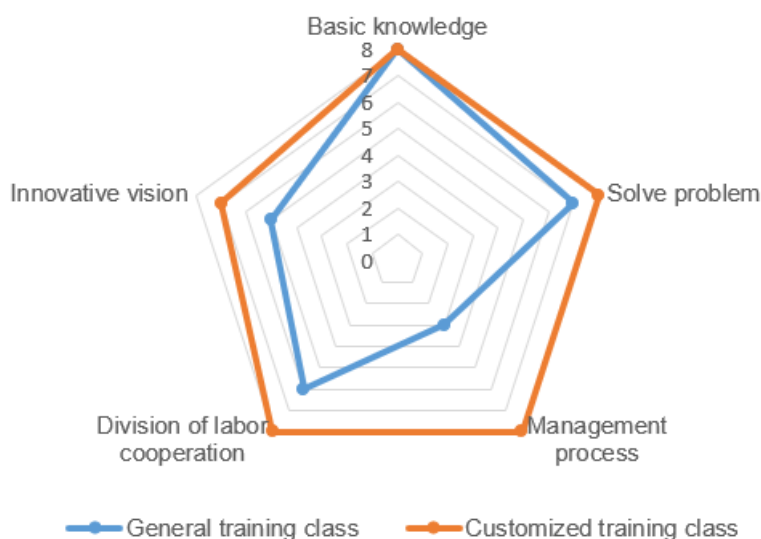


Figure 3 Radar Chart of Teaching Effect Contrast

Discussion of Standardization and Promotion

Through the introduction of this case, it can be seen that the school-enterprise joint customization model has a good effect in improving the teaching effect and improving the school's value to social services. However, whether the customization of such individual cases is suitable for standardization and universalization requires more in-depth analysis and discussion.

Challenges in Customization Models. Compared with the traditional teaching mode, the school-enterprise joint customization model obviously has more requirements in terms of operational procedures, curriculum development, and teacher background. At the same time, it is of great necessity to clearly recognize the new requirements and challenges, so that countermeasures can be taken.

(1) School-enterprise mutual trust relationship is difficult to establish. For the school, the customization model needs to increase the propaganda and visits to the enterprise and establish a mutual trust relationship between the school and the enterprise, which requires the cooperation of the school leaders and functional departments. Therefore, this link requires the support and institutional guarantee of school policy. To get recognition from the corporate society is not a day's work, but needs continuous efforts.

(2) The needs of enterprises vary and the teaching costs are high. The needs of enterprises are different and the needs of the same enterprise in years can be also different. Obviously, there are many variances in the content of the customized classes and it is difficult to form stable teaching content. As a result, this greatly increases the workload and teaching costs of the teacher. At the same time, this point should be solved by establishing a school-enterprise mutual benefit community. Since the customization model is beneficial to enterprises and the regional economy, it can completely form a mutual win model by acquiring enterprise's support or government's funding.

(3) There is high requirement for teacher's ability. Specifically, teacher should have good communication and coordination skills, get familiar with the business management methods, be good at learning the industry to develop new technologies, and quickly integrate into the teaching content. Therefore, it is necessary to recruit excellent and competent teachers with certain business experience.

Standardization Discussion of Custom Classes. Although there are many operational challenges in the customization mode, there are still some possibilities for standardization design under the premise of certain restrictions. Figure 4 is an implementation flow plan for the customization mode.

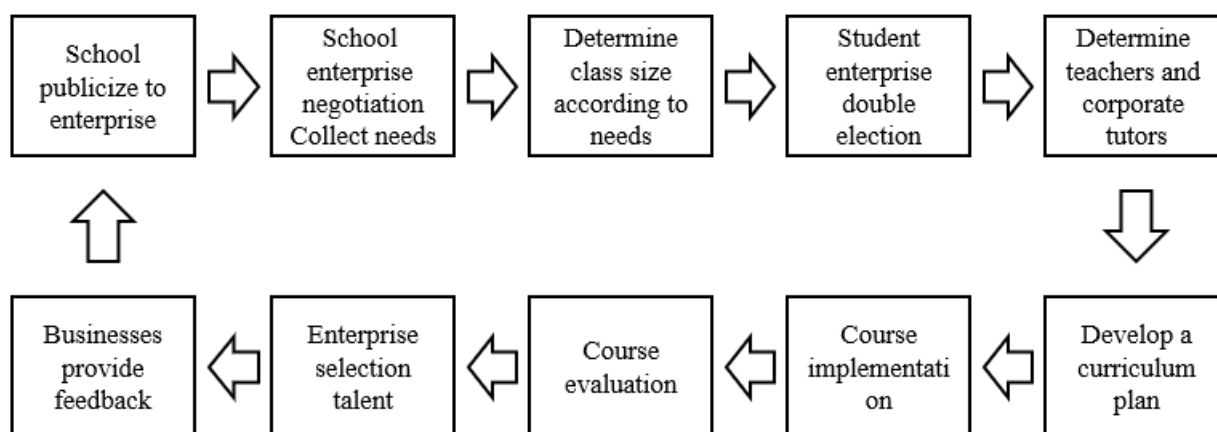


Figure 4 Custom education mode implementation flow chart

First of all, on the premise of obtaining school policy support, through the assistance of the propaganda and school-enterprise cooperation departments to solve the problem of the previous enterprise contact, through the establishment of the company meeting to accept the bulk customization needs, professional teachers are responsible for undertaking the demand. Then, for the diversified needs of enterprises to be screened and classified, in order to improve the efficiency of teaching, we can abandon the extremely small needs, set up customized classes according to the professional direction of the public demand, and conduct student business double-selection to determine the students. Next, assign teachers and selected business instructors to the custom class, and then enter the teaching process. Finally, after the course assessment, the company selected the talents and determined the employment relationship. At this point, a round of customization was

basically completed. In the subsequent enterprise employment process, the school can also accept the enterprise's employment feedback, in order to optimize and improve in the next round of customization, forming a virtuous circle.

Summary

To conclude, the customized talent training model based on “school-enterprise cooperative education” is the link that truly connects the education and needs of social talents. Apart from that, it is a good way to optimize the school-enterprise resource allocation to solve the contradiction between talent supply and demand. If it is integrated with CDIO, OBE and other excellent engineering education models, an education model that is more in line with social development requirements can be formed through continuous exploration in the operation process and teaching plan.

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