The Construction of Ecosystem for Cultivating Automobile Innovative Talents Based on the Development Process of Racing Car Products

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Abstract. Focusing on the cultivation of students' engineering innovation ability, the paper puts forward the talent cultivation concept based on the development process of FSAE racing products, a step-type engineering ability cultivation system has been constructed based on the development process of FSAE racing products; with the construction of characteristic practice platform as the starting point, the innovation ability training system has been established corresponding to grade and progressive; Aiming at cultivating the ability to solve complex engineering problems, the independent learning and autonomous management mechanism has been established, a good automobile innovative talent cultivation ecosystem has been constructed, the education regression of "practical education" project and the experimental demonstration and promotion of the ecosystem model have been realized.

Introduction

Innovation is the source of a country's progress. The so-called innovative talents are the special talents with innovative consciousness, spirit, ability and achievements[1-6]. Cultivating innovative talents is an important task of education. The fundamental purpose of engineering education in Chinese universities is to train engineering innovative talents needed by industry and adapted to social development[7], with the rapid rise of China's automobile industry, In the process of realizing the change from a big country to a powerful country needs a large number of high-quality automotive innovation talents[8-10], however, the current problems existing in the higher engineering education in our country the present stage have obvious: the development goals of colleges and universities are converging, the recognition of application-oriented talents is low, the classroom teaching is the main method, the teaching of practice and innovation is absent, and the teaching staff of engineering education is not satisfactory. It led directly to many outstanding problems such as students' insufficient understanding of the development of the leading edge of the major, narrow professional vision, insufficient learning motivation, lack of professional skills training, lack of engineering practice and innovation ability[11]. The famous learning pyramid theory holds that the learning efficiency of the traditional "spoon-feeding" teaching method is less than 30%, however, the "Learn by practice" teaching method cannot only improve the learning efficiency to 90%, but also exercise the general knowledge ability (teamwork ability and innovation ability) that is difficult to be exercised in the traditional classroom. Driven by project or discipline competition oriented is the different manifestations of "learning by practice", compared with the traditional teaching method, course contests in cultivating students' innovation ability, comprehensive ability and independent ability has a bigger superiority, has the special function of innovation education, to cultivate students' innovative ability, optimizing the process of personnel training, improve the quality of teaching has a unique and irreplaceable role [12-13]. Discipline competition is the best verification and supplement to the theories learned [14] and an excellent platform for cultivating students' general knowledge ability [1-6].

FSAE competition platform has obvious systematic, integrated project operation characteristics and strong color of comprehensive engineering practice [8]. Aiming at the problems of simple traditional teaching methods, outdated teaching contents and low learning interest of students in the
training process of automotive engineering talents in our school, with the help of formula university car racing (fuel oil vehicle, electric car, unmanned vehicle) platform (FSAE) Jointly built by the school and Dongfeng Company commercial vehicle company and subject competition to achieve project-driven and interest-based guidance, Taking the student engineering innovation ability training as the center, based on FSAE competition platform, Our school puts forward the talent cultivation concept of "based on the development process of FSAE racing products", and takes the construction of characteristic practice platform as the starting point to establish a progressive engineering ability training system corresponding to the grade. Aiming at cultivating the ability to solve complex engineering problems, this paper establishes the mechanism of students' independent learning and autonomous management, constructs and forms a good ecosystem of automobile innovative talent cultivation, and realizes the education regression of "practical education" project [8, 15] and the experimental demonstration and promotion of the ecosystem model.

Cultivation Concept of Talent Based on FSAE Racing Product Development Process

Since its establishment in 2011, FSAE (fuel oil vehicle, tram, and unmanned vehicle) platform jointly built by the university and Dongfeng Company commercial vehicle company, has ranked among the top five in China, won the national championship for three times and participated in international competitions for five times, which has obvious brand effect in the cultivation of innovative talents. Because FSAE car covers automobile product development process design, manufacturing, test, cost control, marketing planning, enterprise management and the team cooperation, such as process, students need to master in the process of development of FSAE car auto product development standards, rules and processes, and in automotive design, manufacturing, debugging, cost control, business, marketing, project management and team coordination, etc, will be able to get a full range of innovative training, and FSAE competition platform to implement in the process of educational theory and technology of blending, paying equal attention to knowledge/skills/quality. Through the deeply analysis of talent ability requirements in the development process of FSAE racing products, we put forward the concept of talent training based on FSAE car development process, and according to the product development process to the car class car professional knowledge, ability, quality requirements, to expand of engineering quality, to attach equal importance to technology, management and humanities and we have formed a product development process based on car engineering ability training method and practice process, built step ability training system based on FSAE car product development process engineering.

The engineering capability training system of the product development process with FSAE racing car as the main body is divided into two levels: Basic engineering ability and comprehensive engineering ability. The first training level mainly refers to the basic engineering ability training level composed of automobile design ability, automobile manufacturing ability, automobile test ability, automobile marketing ability, automobile cost control ability and automobile enterprise management ability; While the second levels mainly aimed at the current social development to the specifications and quality requirement of the engineering talents, innovation, collaboration, engineering practice ability, comprehensive engineering ability training level of leadership and international vision, the two levels of class engineering talents (basic engineering ability and comprehensive ability) culture relying on the FSAE car innovation platform has formed the engineering ability training method based on the automobile product development process and practice process.

Establishment of Progressive Whole Process Engineering Capability Training System

Aiming at the characteristics of automobile specialty and based on the development process of FSAE racing products, a progressive whole-process engineering ability training system is constructed. The progressive engineering capability training system based on the FSAE racing product development process divides the innovation activities into: preparatory stage, stage of learning, formal and upgrade the four stages of progressive type, the implementation objects of the
four stages are freshmen, sophomores, juniors and seniors of automobile, the training objectives are interested excitation, basic skill learning, training and overall quality improvement. The learning content of each progressive stage is from simple to deep, gradually, interlinked and continuous, supplemented by a fair and smooth promotion channel and a benign talent training mode with students as the main body, instructors as the auxiliary body, and mentoring and doing while learning, which has greatly mobilized the subjective initiative of students in learning and innovation. Construction of engineering ability training system based on FSAE competition platform, so that all stages of outstanding college students can get a good exercise and grow well, steady rise of student ability, competition scores increase year by year, which has realized Progressive cultivation of the automobile class engineering talents by the interest cultivation—skills learning—special ability cultivation—to cultivate the comprehensive ability.

Ecological Environment Construction of Independent Learning and Autonomous Management

In order to create an excellent engineering education learning ecosystem, We take the achievements of automobile product development as the guidance, introduce the enterprise management mode, and form a "six-in-one" engineering ability cultivation mechanism and corresponding incentive mechanism integrating operation mode, teacher team, rules and regulations, technical standards, promotion channel and cultural atmosphere. Construction of an ecosystem for cultivating automobile innovative talents based on FSAE racing product development process is education teaching laws aimed at the training of Automotive engineering talents. scientific application of ecology principle method form talents growth environment and power systems having the ability of independent learning, autonomous management, progressive development of knowledge and cyclic renewal[16].Based on FSAE car product development process, establish "Six one body" autonomy cultivation mechanism included in a reasonable and effective enterprise operation mode, well-directed instructor team, the highly effective rules and regulations, Open and Shared technical standards, fair and smooth promotion for open sharing channel, culture of action and innovation, which realizes a virtuous self-cycle of "independent learning, self-management and self-motivation" in the process of cultivating innovative talents ,meanwhile greatly stimulates students' enthusiasm and vitality for learning and forms a benign ecological environment with fertile soil. The "six-in-one" engineering ability cultivation mechanism are reasonable and effective enterprise operation mode, well-directed instructor team, effective rules and regulation, open and Shared technical standards, fair and open channels for promotion.

In order to improve the cohesion and competitiveness of the innovation team, a fair and smooth promotion channel has been established in the whole process of echelon talent training system. If only students are initiative, hard work, and win the recognition of everyone in the four progressive stage, they will get the corresponding promotion position from the first stage of the preparatory team members to the parts responsible person, and then gradually to the subsystem responsible person and project responsible person. Fair and smooth promotion channel ensures the sustainable development of the whole ecosystem, greatly improves the learning efficiency of new team members, stimulates the sense of competition among team members, and is obvious in the demonstration effect.

Practical and Innovative F1 Culture Atmosphere

The innovation platform pays attention to the construction of team culture, creates the team culture atmosphere of practical innovation, forms the F1 car culture of "respect, coordination, punctuality, innovation and responsibility" and the F1 spirit of "Life, work, do a car", meanwhile determines the F1 purpose of "striving for the top and driving the future". The formation of F1 team culture provides sufficient nutrition and motivation for the long-term mechanism of Dongfeng Company FSAE innovation platform.
Establish of Perfect Innovation Practice Incentive Mechanism

Established a perfect incentive mechanism for innovation practice, and achieved the "four excellent and one exemption", which stimulated the enthusiasm and initiative of college students to participate in innovative practice activities. In order to encourage college students to actively participate in innovative practice activities, the school has developed a series of innovative incentives measures. Exemption-Innovation Credits: College students participate in innovation activities. They are deemed to be exempt from relevant professional elective courses in accordance with the “College Students Participate in Innovation Activities to Exempt Course System” and receive certain innovative credits; priority innovation project funding: College students who participate in innovation activities can get a certain amount of innovation awards, and priority is given to the application of national college students scholarship and Dongfeng Company scholarship; Priority for graduation and employment: excellent team members who participate in innovative activities can apply for early graduation after completing the credits stipulated by the school; Priority to recommend high-quality jobs: college students who participate in innovative activities will have the opportunity to be recommended to work in Dongfeng Company; Priority to go abroad for exchange competition: students with excellent innovative performance will also have the opportunity to go abroad on behalf of the team. The implementation of this series of innovation incentive measures has greatly stimulated the enthusiasm and initiative of college students to participate in innovation practice, and has formed an effective innovation incentive mechanism.

Conclusion

Since its establishment in 2011, Dongfeng Company HUAT formula student racing team, a platform jointly built by the university and Dongfeng Company commercial vehicles co., LTD. (FSAE), has been ranked among the top five in China and won the national championship for three times. The achievements made by Dongfeng Company HUAT team have attracted the attention of many high-end mainstream media. In the program of "charming China city" and "Geek go", the team has appeared on CCTV twice and become a golden card of Shiyan, the car city.

The Quality of Talent Training is Improved Obviously Based on the Training Mode of "FSAE Racing Product Development Process"

Students' comprehensive quality and practical innovation ability have been comprehensively improved; the major of vehicle engineering has become the school's ace major; Founded the first Sino-British racing major in China;60% of graduates are employed by well-known automobile enterprises such as Dongfeng motor Company, Zhengzhou Yutong Automobile Company, Anhui Qirui Automobile Company, Beiqi Futian Automobile Company, Shanghai Automobile Company and Liuzhou Automobile Company with the employment rate remaining above 96%. Due to solid professional knowledge and strong engineering ability, graduates of this major are well received by employers.

Students Benefit a Wide Range and Significant Results in the Competition

Our school Dongfeng Company HUAT team had participated in the 8th China University Student Formula Competition and the 3rd German Competition and the 2nd Japan Competition. For the seventh consecutive year, he won the top five in China and won the national championship three times, becoming the top college student team in China. 180 students in the team received the "Automotive Engineer Professional Technical Qualification Certificate" issued by the China Automotive Engineering Society, recruiting new recruits more than 200 annually, benefiting a large number of students. FSAE competition platform stimulates the enthusiasm and vitality of students to participate in innovation competitions. Every year, 300 students participate in various innovation competitions for college students, and over 200 innovative works are completed. In the past five years, students majoring in automotive engineering have won 130 awards in disciplines above provincial level, including 12 national first prizes, 20 national second prizes and 27 provincial first
prizes. Students have presided over and completed 47 university-level innovative research projects for college students, 5 national innovative training projects for college students, 12 provincial innovative training projects for college students, 15 authorized patents for students, and 44 published scientific research papers.

External Promotion and Demonstration Radiation is Obvious

South China University of technology, University of Bolton and other more than 20 domestic and foreign universities have visited for exchange and study, and received more than 400 visitors every year. In 2013 and 2016, held two press conferences of formula one Chinese university students auto contest. Due to the achievements of our university made in the cultivation of students' engineering ability, it has a great impact on similar universities and industries. Over the past five years, relevant media at home and abroad have reported more than 500 times, and the results have been further established among similar universities, which has a good demonstration effect on the cultivation of automotive innovative talents in local application-oriented engineering universities.

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