

Exploration on Construction of Automobile Specialty in Application-Oriented Universities

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Abstract: This paper takes the School of Automobile and Transportation of Chengdu Institute of Technology as an example. The main measures and means of building automobile specialty in application-oriented universities are discussed. Specifically, it includes the integration of industry and education, and the joint construction of automobile industry college with local automobile manufacturing enterprises. Promote teaching by competition and actively organize students to participate in the discipline competition of automobile specialty. Promote education reform and introduce new energy vehicles and intelligent connected vehicle related curriculum resources. International exchange, cooperation and exchange with foreign universities on automobile majors. Finally, the problems and deficiencies in the process of specialty construction are analyzed. These above can provide reference and reference for brother colleges in similar situations to develop automobile majors.

1. Introduction

With the development of China's automobile industry in recent years, the demand for high - quality technical talents has also increased rapidly. At the same time, as the automotive industry has gradually spread from the traditional Northeast and eastern coast to the west, the demand for car professionals in the west has increased significantly. As of 2022, China's car ownership was about 319 million (including 31.2 million new energy vehicles) ^[1], which has become the country with the largest amount of car ownership. Such a huge demand for automotive aftermarket, urgently need a large number of professional car service talents. These have created good conditions for the development of automotive majors for western universities.

The concept of application -oriented undergraduate is mainly the school's running positioning is the application technology type rather than an academic general undergraduate college ^[2-6]. Compared with the traditional undergraduate talent training model, application -oriented undergraduate education emphasizes the application scenarios of the training target in the industry. Graduates can be competent as the role of craft technicians and on -site engineers in a short period of time. Compared with the talent training model of higher vocational colleges ^[7], application -oriented undergraduate education attaches more emphasis on students' mastery of basic knowledge

and basic theories^[8]. After engaging in the work of this major for a period of time, they can have the ability to solve complex engineering problems.

Chengdu Institute of Technology is a local and applied undergraduate university. The School of Automobile and Transportation, as its secondary college, has been transferred to Yibin Campus as a whole. At present, the college has opened two undergraduate majors: vehicle engineering, automobile service and engineering. After earlier efforts, professional construction has achieved initial results. In 2022, the major of automobile services and engineering has been included in the first -class undergraduate construction point in Sichuan Province, and is actively applying for Yibin's characteristics.

2. Main Construction Measures

In view of the needs of the development of the automobile industry in the region and based on the actual conditions of application-oriented undergraduate education, our college has carried out the construction of the automobile specialty from the following aspects.

2.1. Integration of Industry and Education

The School of Automobile and Transportation, with the support and encouragement of the university and Yibin Municipal Government, cooperates with Yibin Kaiyi Automobile Co., Ltd. to form a new energy vehicle industry college. After several rounds of negotiations and visits, the two sides have reached a comprehensive strategic cooperation plan on joint talent training, research project research, co -construction training bases, teaching materials and curriculum standard construction.



Figure 1: Teachers and students visit the exhibition hall of Kaiyi Company.

The main tasks that have been carried out include: Chengdu Institute of Industry Union Kaiyi Company and the Yibin Research Institute of Southwest Jiaotong University jointly declared the completion of the Sichuan New Energy Recycling and Reliability Test and Application Engineering Research Centre. From 2023, Kaiyi has been deeply involved in the graduation design of undergraduate students majoring in automobile. Each year, 20 outstanding students are selected, and Kaiyi Company will provide graduation design topic and on -site internships. Relying on Kaiyi's post -doctoral mobility station, the college carried out joint training for doctoral doctoral training. Establish a Kaiyi lecture hall, which is jointly designed by enterprises and schools to jointly design lectures and content related to automotive technology. The school actively recommends outstanding graduates to work in Kaiyi.

Through the above -mentioned cooperation, the college's automobile major can receive the support and help of the enterprise from talent training, teachers' construction and scientific research. The purpose of application -oriented education of local service enterprises basically achieves a win -win situation between schools and enterprises.

2.2. Improve Teaching with Discipline Competition

The most famous event in the automobile professional discipline competition is Formula Student China. This competition is sponsored by the China Society of Automotive Engineering and relevant universities and enterprises [9]. The student team in school is required to produce a small electric car or a gasoline-powered car to participate in the competition within one year according to the requirements of the competition rules. Due to the characteristics of high convergence, strong professionalism, good academic atmosphere, and comprehensive training of students' comprehensive ability to train this competition, it has attracted a large number of colleges and universities to participate in the competition.

Since the fall of 2020, the college has formed the team of Formula Student Combustion China (FSCC) - "Wing Light Year". For the first time, the team successfully completed all the required competition contents, racing design answers, cost defense, business response, linear acceleration, 8-character rings, high-speed obstacles, durability testing and other competitions, and won the third prize of the National Award. In the second year, due to the epidemic, the team participated in the race online, and won the third prize in the country for the second consecutive year after overcoming the adverse factors such as the repeated epidemic and the high temperature in the summer. Beginning in 2023, the college has begun (electric vehicle FSEC) participating teams, and strives to achieve excellent results in the field of electric squares.



Figure 2: Teachers in this major guide the Formula Racing of the student team.

While guiding students in the specific technical field to guide students to carry out the production of tribal racing cars, it will involve the technical problems and key points that encountered and solved during the design and production of racing cars into teaching cases, graduation design questions and scientific research papers, and will have a possession Technical solution application patent for significant technological innovation points. Through teachers and students to carry out team collaboration, the design and production tasks of complex automobile systems have been completed, which not only improves the teacher's scientific research management ability, but also improves students' team collaboration ability. In real projects, let students use the professional knowledge they have learned for the design and simulation of the car and the physical debugging of the car, which is not only in line with the school motto of "conjunction of brain and hands, unity in learning and practice ", but also meets the requirements of application-oriented undergraduate talent training for students' comprehensive ability. The core members of the participating teams can basically have the ability to solve complex engineering problems. They have stronger advantages in both employment and continuing further studies than ordinary students.

2.3. Promote Educational Reform

In order to comply with the trend of green, low-carbon and sustainable development, the Chinese government proposed the goal of carbon neutrality and carbon peak in 2020^[10]. New energy

vehicles have become the focus of automobile development ^[11]. At the same time, a new round of technological revolution, represented by big data, artificial intelligence, cloud computing, the Internet of Things, 5G communication and other technologies, has promoted the development of the automobile industry towards intelligence, and assisted driving and even driverless technology is becoming more and more mature. Therefore, in the process of car professional talent training, the introduction of related courses with new energy vehicles and intelligent connected vehicles seems increasingly urgent.

The college actively organized professional teachers to conduct teaching reform research, and successfully applied for provincial -level new energy vehicles to construct virtual simulation experimental teaching centres. Through independent development, transformation of scientific research results and the use of existing resources, three virtual simulation items such as "New Energy Vehicle Virtual Simulation Project", "Auto Electronic Virtual Simulation Project", and "Automobile Internet Virtual Simulation Project" were built. A total of 15 experimental projects have been developed in the three projects, such as intelligent connected vehicle algorithm test simulation experiment, vehicle power test simulation experiment, new energy vehicle power electromagnetic detection and maintenance simulation experiment, etc. These projects fully reflect the "engineering, research and exploration" characteristics of the professional group curriculum experiment around new energy vehicles.



Figure 3: New Energy Vehicle Construction Virtual Simulation Experiment Teaching Centre.

In addition, the Teaching and Research Office of Vehicle Engineering and Automotive Service and Engineering has consciously introduced the relevant courses of new energy vehicles and intelligent connected vehicles when revising the talent training program. For example, the structure and principle of new energy vehicles, power battery technology of new energy vehicles, power electronics technology of new energy vehicles, on-board network technology, etc. The introduction of the above courses will enable students to initially have the ability to solve the design, assembly and commissioning related technologies of new energy vehicles and intelligent connected vehicles, and lay the foundation for the subsequent preparation of the new energy vehicle engineering specialty.

2.4. International Exchanges

With the proposal of the "Belt and Road" initiative, the internationalization level of higher education in China has continued to improve. In 2016, the Ministry of Education issued the document "Promoting the Education Action of Jointly Building the the Belt and Road", focusing on education connectivity cooperation; Carry out talent training cooperation and jointly build the Silk Road cooperation mechanism. This has created good opportunities and conditions for western universities to promote the development of education internationalization.

Hungary is the first European country to sign the "the Belt and Road" cooperation document with China. On the basis of good communication in the early stage, in 2020, Chengdu technological University and Széchenyi István University in Hungary established preliminary cooperation

intentions through online meetings. This university is located in Győr, Hungary's automobile and heavy industry manufacturing center, where Audi's largest engine manufacturing plant in the world is located [12-13]. The automobile engineering specialty of Széchenyi István University is the dominant specialty of the university. It has built the most advanced automobile science laboratory in Hungary and has many automobile engineering experts and scholars with practical operation experience.

In recent years, the School of Automobile and Transportation and the University of Széchenyi István in Hungary have held many offline exchange meetings and online cooperation video conferences, effectively promoting the curriculum construction, talent joint training and scientific research cooperation of the two universities in the field of automobile. On this basis, the two sides will focus on the following three themes of cooperation: power battery, automatic driving and the Internet of Vehicles, and university formula competition.

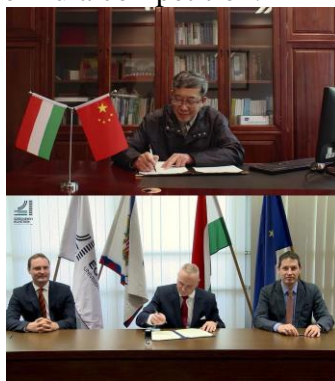


Figure 4: The Presidents of the Two Universities Signed a Cooperation Agreement Online

3. Main Construction Measures

Although the college has made some achievements in the construction of automobile majors through several years of efforts, there are still some shortcomings and shortcomings. It is mainly shown in the following aspects:

At present, the main cooperation between schools and enterprises is still at a relatively shallow stage. For example, the school provides staff training and lecture services for enterprises; or the enterprise can determine the prospective graduates in advance to carry out targeted internship practice through two-way selection, so that the recruited graduates can have all the skills required to work in the enterprise as soon as possible. Deeper cooperation, such as the provision of technical consultation and service to enterprises or the joint development of new equipment and new products, is still limited by the conditions of professional scientific research equipment and the scientific research experience of teachers, and has not been well developed.

The research on the teaching reform of automobile majors is not deep, and the construction of curriculum resources is not rich. The college's undergraduate majors in automobile are relatively short in time. The teaching reform that has been carried out is mainly based on the virtual experiment teaching centre. There are not many offline first-class courses or online and offline hybrid first-class courses that have been built. The number of self-made experimental equipment or professional experimental projects developed by teachers is small. In addition, the conditions of teaching and scientific research experiments related to the technology of intelligent connected vehicle and new energy vehicles still need to improve.

In terms of international cooperation, the depth and breadth of cooperation with foreign institutions need to be further improved. At present, the school has relatively few international partners, and the form of cooperation still mainly stays in the aspect of conference exchange.

Affected by the COVID-19 in recent years, the College and its international partners have not taken substantive steps in joint talent training and scientific research.

4. Conclusion and Prospect

Compared with the same type of majors in the eastern universities, the automobile majors in the western application-oriented undergraduate universities are relatively slow in development and more difficult to build due to the influence of regional factors and university level. However, if we seize the development opportunities of the local automobile industry, have the courage to explore and actively plan, strengthen the cooperative relationship with the government and enterprises, and constantly improve our teaching level and scientific research ability. A new way will be found to serve the local automobile industry and develop our own automobile specialty characteristics.

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