

Research on the Reform of Higher Automotive Engineering Education Under the Background of Artificial Intelligence

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Abstract—With the wide application of Artificial Intelligence (AI) in the field of automobile, IntelliDrive has become a new development direction in the automotive industry. Under the background of AI, automobile companies put forward new requirements for the ability and quality of automotive engineering talents. There is a huge gap in compound automotive engineering talents that can meet the needs of automobile enterprises. This paper starts from the current situation of auto companies' demanding for talents in automotive engineering under the background of AI, analyzes the current problems in the process of training automotive engineering professionals in Chinese colleges and presents a plan to promote the reform of the training mode of automotive engineering professionals in colleges from four aspects: curriculum system construction, teaching staff construction, school-enterprise joint training, strengthen the personalized training of students.

1 INTRODUCTION

Under the background of AI, smart cars are the strategic direction for the development of the global automobile industry, for which China has also made important arrangements. A series of important documents such as 《Made in China 2025》 ([2015] No. 28) emphasized the importance of the smart car industry; the National Development and Reform Commission issued the 《Smart Car Innovative Development Strategy》 (Development and Reform Industry [2020] No. 202) to accelerate the advancement of the innovation and development of smart cars, and proposed that a system of technological innovation, industrial ecology, infrastructure, regulations and standards, product supervision and network security for Chinese standard smart cars will be basically in place by 2025. The development of the smart car industry put forward higher requirements for automotive engineering professionals, and it is urgent for colleges to reform and improve the existing talent training model.

2 THE CURRENT SITUATION OF AUTO COMPANIES' DEMANDING FOR VEHICLE PROFESSIONALS UNDER THE BACKGROUND OF AI

The domestic training system for professional talent engaged in AI in the automotive field is still lagging behind and cannot adapt to the developing speed of the global intelligent network and autonomous driving

industry. In particular, it needs to be pointed out that there is a shortage of compound talents with both AI technology and automotive engineering, so many potential possibilities have not be effectively tapped [1].

2.1 Huge gap in the talents of intelligent connected vehicles

According to 《China Intelligent Connected Vehicle Talent Development Report》, as of the end of 2018, the total number of professionals engaged in intelligent connected vehicles and autonomous driving is about 12,000 among the 91 companies participating in its survey. The total number of inter-disciplinary talents is estimated to be less than 20,000. Among the 91 companies, the highest proportion of job shortages are intelligent driving technology R&D engineers①, reaching 25%; ADAS system R&D engineers②, system security engineers③, and big data analysis engineers④ are also in the forefront, as shown in Figure 1.

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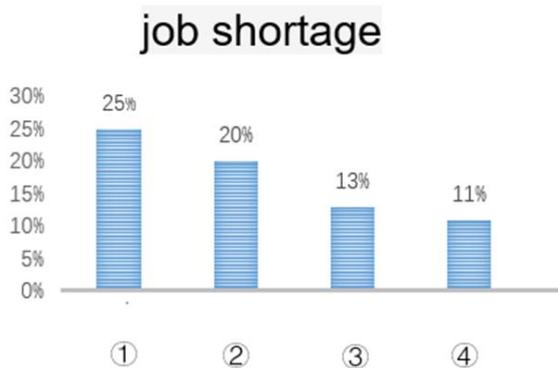


Figure 1. The current situation of the shortage of job gaps in auto companies under the background of intelligent driving.

2.2 The reform of the automobile industry puts forward new requirements for the quality and ability of automobile talents

Facing the trend of automobile intelligence, automobile enterprises need automotive engineering students to have a higher sense of innovation and ability to overcome the current bottleneck technology of IntelliDrive and make contributions to the journey of automobile intelligence. It puts forward new requirements for automotive engineering professionals in the knowledge reserve, hands-on practical ability, comprehensive knowledge application ability, professional quality and international vision. Automotive engineering is a multi-disciplinary and complex major, which requires students not only to have traditional mechanical, electronic, control and other professional knowledge, but also need to master artificial intelligence, microelectronics, system integration, cloud computing and other high-tech technical knowledge to overcome new challenges. At this stage, it is necessary for artificial AI-oriented automotive professionals to shoulder the responsibility of controlling the overall situation in the process of automobile research and development, design and manufacturing, and apply the technologies of various disciplines reasonably to the automobile with their own learning of multi-disciplinary expertise, so as to achieve the perfect integration and application of various technologies.

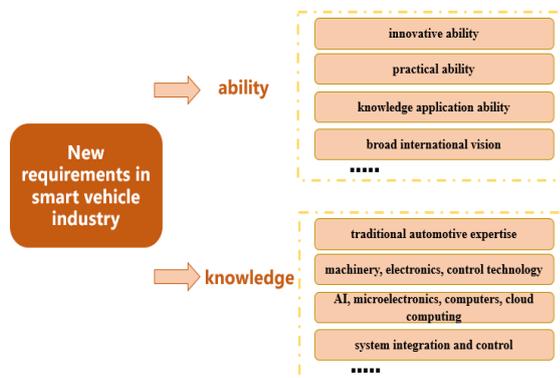


Figure 2. The new requirements of automobile companies for talents under the background of AI.

3 PROBLEMS IN THE TRAINING OF AUTOMOTIVE ENGINEERING PROFESSIONALS

With the development of the smart car industry, the college students major in automotive engineering are gradually unable to meet the needs of enterprises. The main reason is that the automotive engineering professional talent training system has problems such as old curriculum system, one-sided knowledge system, and insufficient training of students' comprehensive innovation and practical ability.

3.1 Imperfect college curriculum system

Under the background of AI, the traditional automotive engineering professional curriculum system has been unable to adapt to the integrated development of AI in the automotive industry. At present, the automotive engineering professional curriculum system in colleges is still based on general education courses and subject professional basic courses, lacks AI courses, such as intelligent planning, data mining, game theory, Python language, big data, smart car interconnection technology, intelligent transportation systems, etc. Courses related to AI are rarely offered and generally carried out in the form of professional elective courses. College students with traditional automotive engineering knowledge lack scientific thinking and mathematical knowledge in the field of AI and they are unable to combine automotive engineering expertise with AI in theory, methods, technology, and application knowledge. This current situation is obviously inconsistent with the development trend of automobiles, and it is still unable to meet the requirements for training innovative compound talents in automotive engineering under the background of AI.

3.2 Insufficient training of students' practical ability

Practical activities is an important link and effective way to cultivate students' engineering practice ability and problem-solving ability. However, the current training system lacks the stimulation of students' practical ability and the correct guidance of combining theory and practice. At present, the single form of practical teaching is a common problem in colleges. Teachers only complete the practice teaching through classroom group discussion, case analysis, video learning, observation, etc., which simply stay on the surface and form. Meanwhile, colleges lack the construction and expansion of practical teaching bases, which cannot provide students with sufficient practical opportunities and platforms. In addition, practical teaching staff's inadequate guidance and insufficient reinforcement of professional theoretical knowledge are also not conducive to training students' practical ability.

3.3 Insufficient efforts to cultivate students' innovative consciousness

Under the current mode of cultivating college personnel, the atmosphere of innovation in college is not strong, and the innovation idea has not been implemented. Students majoring in automotive engineering generally lack the sense of innovation, with some problems such as narrow range of knowledge, single point of view and lack of international vision. In the classroom, teachers' teaching methods are relatively simple: "instillation" teaching is mainly used in the process of imparting knowledge, which is not enough to cultivate students' innovative qualities. After class, due to the lack of policy encouragement and guidance, students' sense of innovation cannot be stimulated, and the proportion of students participating in innovation and entrepreneurship projects is relatively low.

4 REFORM OF THE TRAINING SYSTEM FOR AI-ORIENTED AUTOMOTIVE ENGINEERING PROFESSIONALS

In order to adapt to those changes in the automotive industry, the training system of automotive engineering professionals in colleges is also in urgent need of reform and innovation. To address the outstanding problems in current talent training, It can be reformed from four aspects: curriculum system construction, teacher team construction, school-enterprise joint training, and student personalized training..

4.1 Improve the curriculum system based on the development needs of the industry

Smart cars integrate three key points of environmental perception, decision-making, and execution, and interact with multiple platforms in real time. It is a comprehensive industry that simultaneously uses key technologies such as automotive engineering, software engineering, computer science, and artificial intelligence. It is difficult to meet the challenges in the development of automotive engineering specialty under the background of intellectualization by simply relying on the knowledge reserve of a certain discipline. Figure 1 shows the relationship between smart car research and other required professional domain knowledge. Therefore, the teaching of the automotive engineering major should be integrated with multiple disciplines to achieve the overall development of talents. It means it is necessary to deepen the reform and innovation of the curriculum system, analyze and formulate talent training standards, curriculum system and management mode suitable for the direction of artificial intelligence, and deeply explore a new teaching mode of interdisciplinary cross integration. After analyzing the knowledge, technology and quality capabilities required by the traditional automotive industry, the curriculum system should be based on the ability to accelerate the transformation of automotive intelligence and carry out system reforms to meet the country's current requirements for higher education, and continuously optimize and improve professional courses

and content design. The focus of training should be placed on students' engineering practice ability and innovation sense, so that they can become a compound talent with strong professional knowledge , application ability, high professional quality, strong engineering practice ability and innovative thinking.

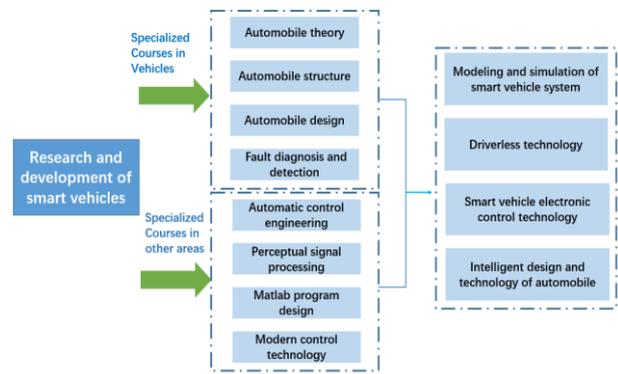


Figure 3. Relationship between research on smart cars and other required specialized courses

At present, the scope of students' professional courses is narrow, the types of courses are single, which leads to a one-sided grasp of knowledge. In order to cross the boundaries between different majors and achieve the cross integration of different disciplines, we should try to build an interdisciplinary shared learning platform that includes multiple AI-related majors. This platform accommodates teaching and experiment resources in multiple fields, and provides teachers and students in automotive engineering, computer, automation and other majors for communication and learning [2]. In the form of tutor sharing and online classroom co-construction, some professional courses are paired and connected to improve the knowledge system of students' cross-professional learning on the basis of equivalent public basic courses.

4.2 Improve the teaching staff and introduce technical talents

The cultivation of high-quality talents requires a high-level teaching staff. On the one hand, colleges should actively introduce outstanding talents and expand the teaching staff; on the other hand, they need to continuously improve the theoretical knowledge and comprehensive capabilities of the original teaching staff.

For the overall innovation of the automobile industry, it is not enough to rely solely on the original automotive engineering teachers. Colleges need to further introduce excellent teachers in related technical fields such as AI, computers, precision instruments, automation, electronics and electrical engineering. Not only academic research talents, but also enterprise technical talents with rich engineering practice background , colleges should introduce talents in a variety of ways according to different categories and levels.

Due to the shortage of talents in the new engineering professional fields and the scarcity of high-quality teachers, usually it is difficult to introduce talents that meet the intelligent training model into college teaching staff. Therefore, it is possible to pair related enterprises

with colleges and establish a school-enterprise cooperation system. In order to improve teachers' professional technical level and innovative practice ability, we can encourage college teachers to observe and practice within the enterprise. In addition, it is necessary to give full play to the advantages of comprehensive colleges, break down the barriers between disciplines, carry out the linkage among teachers from different colleges, integrate teachers from multiple specialties into the same subject group to make the construction of the teaching staff diversified, which eases the shortage of professional teachers and the simplification of the professional field.

4.3 Strengthen practical education and promote joint training mode

Practical teaching is a key link in cultivating innovative compound talents in automotive engineering. Therefore, colleges should increase the proportion of practical teaching to highlight the cultivation of students' engineering practical ability and innovative ability.

Through the establishment of a sound enterprise-school joint training system [3], the professional qualities of students are further improved, as shown in Figure 4. Colleges can regularly organize students to observe in cooperative enterprises, so that students can get in touch with the new developments of the industry's first-line technical level, thereby enhancing their innovation sense and practice ability. Colleges can also hire high-level technical talents from enterprises into the campus, teaching technical knowledge as part-time teachers, guiding students in practice training or curriculum design, and participating in AI-oriented automotive engineering professional talent training system revision and curriculum system innovation; At the same time, students can use the advanced test equipment provided by the company under the guidance of technicians and teachers to carry out a series of innovative experimental projects, such as national innovation, scholastic innovation, Internet Plus and so on, or participate in solving corporate technical problems. The enterprise-school joint training mode can not only promote the construction of industry-university-research platforms, help social enterprises and universities to integrate and cultivate talents, but also solve related technical problems for enterprises, thereby mobilizing enterprises to participate in cooperation; at the same time, it can promote the establishment of platforms such as enterprise practice teaching parks and innovative practice bases.

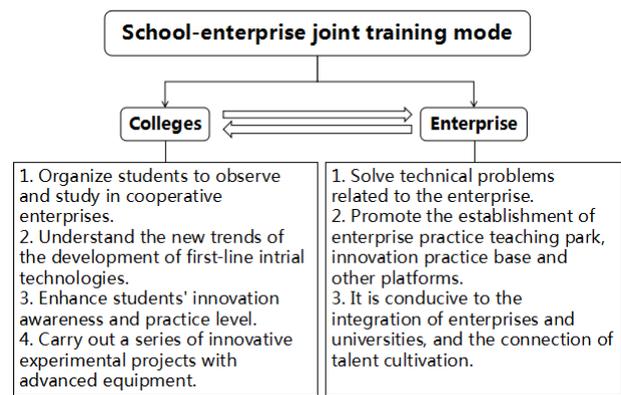


Figure 4. Significance of the school-enterprise joint training mode

In addition, colleges should also actively cooperate with domestic and foreign research institutes in the field of smart cars, and strive to build industry-university-research cooperation test platform. Colleges should cooperate with research institutes and enterprises to actively carry out science and technology competitions about smart cars, so as to create a strong academic atmosphere for students, expand international vision, and stimulate students' sense of ownership and strong interest in intelligent research.

4.4 Cultivate innovative ideas, strengthen and implement personalized education mode

To meet the needs of students with different specialties, interests and employment directions, the AI-oriented training mode reform of automotive engineering should carry out through the training concept based on individualized teaching, to increase the core competitiveness of students in the smart car market and cultivate high-quality composite talents urgently needed by enterprises.

With the continuous integration of the Internet and higher education, the teaching philosophy and teaching mode of colleges are under constant impact. With the support of "Internet Plus education" and science technology, students have gained the possibility of personalized learning. The Internet not only provides students with a convenient and equal platform for self-study, but also forms an adaptive learning service system which realizes the self-quantification and management of students. Some scholars put forward that building a wisdom resource center is the premise of individualized teaching; Creating intelligent learning environment is the practice field of personalized learning. The establishment of wisdom evaluation system is a good guarantee for students' personalized growth [4]. Using online learning platforms to obtain the behavior of student and using the intelligent monitoring system to collect students' learning situation in class we can build up a big data system for the learning process to control the quality of students' learning and help students master personalized learning methods like pushing high-quality learning resources for students so as to promote the individualized development of students and improved the quality of talent training. [5]. The educational model of individualized teaching encourages students to think independently and break the

routine, promotes their individualized development and cultivate their innovative practical ability. Therefore, colleges should actively build network intelligent teaching platform to strengthen and implement the individualized teaching mode

REFERENCES

- [1] Qin,L.,Huang,Q.,Yu,C.,“Vehicle engineering professional talent training under the background of artificial intelligence era”[J]. *Technology and Economic Guide*, 2019,27(36), pp. 121.
- [2] Zhang,X.,Wang,H.,Zhang,C.,Ge,H.,Huang,H., “‘Interdisciplinary Training’: a curriculum to build students' interdisciplinary research ability”[J].*Research and Exploration in Laboratory* . Vol. 32, No. 11, Nov. 2013,pp. 321.
- [3] Xu,X.,Shen,Y.,Zhong,S.,Jiang,Y.,Zhang,C.,“Exploration of emerging engineering education and the cultivation of innovative talents [J],” *Research in Higher Education of Engineering*,2020,2,03, pp. 19.
- [4] Liu,H.,and Dai,M., “The practical transition of individualized learning in the era of ‘Internet Plus’ : From ‘Teaching in Accordance with Aptitude’ to ‘Ability to Teaching in Accordance with Aptitude’”[J],*China Educational Technology*,2019,7, pp. 46.
- [5] Zhang G,and Jiang J, “Construction and practice of personnel training system of ‘Integration of Industry and Education, Accurate Education’ for artificial intelligence technical service specialty”[J]. *Journal of Higher Education*,2020,24,pp.159.