

Analysis of the Change and Development of Automobile Major in Higher Vocational Colleges

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ABSTRACT

The transformation and upgrading of the automotive industry and industrial reform have brought new demand for automotive talents. This paper analyses the problem of talent training for the setting of Automobile major in higher vocational colleges. First of all, the examination and approval situation of automobile major in China's Higher Vocational Colleges in the past five years was summarized and analysed, and the change characteristics of the number of major records and the influencing factors were combed. Next, the problems and challenges faced by the development of automobile major in higher vocational colleges are discussed from the aspects of major group system architecture, major construction experience, major construction supporting resources, etc. Then it puts forward the construction suggestions for six aspects: deepening the reform of education evaluation, top-level design of major construction, three education reform, construction of training room, integration of production and education, college enterprise cooperation and manage system guarantee. Finally, it points out that vocational colleges should pay attention to new majors such as intelligent connected vehicle while developing their advantageous majors.

Keywords: Higher vocational colleges, Major construction, Automobile major, Reform.

1. INTRODUCTION

With the continuous development of China's automobile industry, the demand for automobile skilled talent is also increasing [1]. At present, the automobile industry is facing a once-in-a-century transformation, which brings both unlimited opportunities and great challenges to the development of automobile talents[2]. Facing the reform of the automobile industry, the Ministry of Education dynamically manages the professional catalogue of higher vocational colleges according to law, revising it every five years and adding the major every year, so as to adjust the automobile major of higher vocational colleges timely to meet the needs of the automobile industry in the new era. One of the important tasks of higher vocational colleges is to train highly skilled talent for the industry. In order to meet the market demand, higher vocational colleges have optimized the professional structure by setting up new majors and establishing professional groups etc. Through major construction and teaching reform, we strive to build a professional personnel training system with

distinctive characteristics, obvious advantages and meeting industrial needs, constantly improve the level of major construction and the quality of personnel training, and actively adapt to the needs of economic and social development. The reform of automobile industry also confuses some higher vocational colleges. On the basis of analysing the change of major setting, this paper probes into the current problems and countermeasures, so as to draw inspiration for the development of higher vocational colleges.

2. RECORD OF AUTOMOBILE MAJOR IN HIGHER VOCATIONAL COLLEGES IN THE PAST 5 YEARS

As of December 2020, there are 13 majors in four categories in automobile majors in higher vocational colleges. In 2020, a total of 59,534 majors were recorded in higher vocational colleges, including 2,870 majors in automobile, accounting for 4.82% of the total specialized points. The filing situation of automobile majors from 2016 to 2020 is shown in Table 1.

Table 1. The Filing Situation of Automobile Majors From 2016 to 2020

Major code	Major name	Years				
		2020	2019	2018	2017	2016
560701	Automobile manufacturing and assembly technology	208	218	205	182	174
560702	Automobile testing and maintenance technology	897	918	869	791	737
560703	Automobile electronic technology	233	273	288	301	306
560704	Automobile modeling technology	2	2	2	2	2
560705	Automobile testing technology	4	3	2	2	2
560706	Automobile modification technology	15	16	16	16	14
560707	New energy vehicle technology	518	460	298	189	100
600209	Automobile application and maintenance technology	262	258	249	223	223
600210	Automobile body repair technology	85	94	94	94	90
600211	Automobile use safety management	1	1	1	1	0
600212	Application and maintenance of new energy vehicles	55	49	36	25	12
610107	Automobile intelligent technology	118	62	24	14	8
630702	Automobile Technology Service & Marketing	473	525	575	586	571

According to Table 1, automobile majors are divided into the following categories:

2.1. A few featured majors

There are four of these majors, automobile application security management (Jiangsu college of safety technology), automobile testing technology (Beijing polytechnic, Changchun automobile industry institute, Dezhou vocational and technical college, Hebei jiaotong vocational and technical college), automobile modelling technology (Changchun automobile industry institute), vehicle modification technology (15 colleges, including Guangdong information engineering institute, Henan Mechanical and electrical vocational college etc.). These majors are the characteristic major at some college, the number is little, come 5 years basically nothing changes.

2.2. Maintaining the stable of the Majors

In recent years, the number of major automobile application and maintenance technology has been growing slowly and becoming stable. In 2020, a total of 262 majors points of automobile application and maintenance technology were registered, only 4 more than the previous year. The major mainly cultivates high-quality skilled personnel of automobile application and maintenance ability, engaged in automobile inspection, detection and fault diagnosis, automobile assembly and parts maintenance and technical management, etc.

2.3. Majors on the decline

Automobile manufacturing and assembly technology, automobile electronics technology, automobile testing and maintenance technology, automobile marketing and service, automobile body maintenance technology and other majors have been declining since 2020. The decline reflects changes in the auto industry. In 2018, China's automobile market suffered a severe winter, with the production and sales of automobiles decreasing by 4.2% and 2.8% year-on-year, ending the trend of continuous growth for 28 consecutive years. In 2019, the decline in the automobile industry was further expanded, with production and sales declining by 7.5% and 8.2% respectively. One of the characteristics of higher vocational majors is employment-oriented. The decline in automobile production and sales leads to the reduction of the number of jobs in the industry. Some colleges and universities have to cut relevant majors due to the employment pressure and the decrease in students. On the other hand, with the development of intelligent, connected, electric and shared automobile, the demand for skilled automobile talents in the automobile industry has changed, while the demand for traditional talents has decreased. Third, the industrial upgrading, auto production, maintenance automation degree increased, the demand for pure operation personnel reduced, the corresponding automobile manufacturing and assembly technology, automobile application and maintenance technology and other majors decrease; Fourth, the rise of network marketing has also brought a certain impact on the demand for traditional automobile marketing talents. 5) Merger, reorganization or transfer of automobile

enterprises, based on the professional service of local automobile industry chain to respond accordingly.

2.4. Fast-growing Majors

In recent years, the number of major points of new energy vehicle technology, new energy vehicle application and maintenance, and automobile intelligent technology has risen rapidly. Among them, the number of technical professional points of new energy vehicles has reached 518, ranking second in the number of automobile majors, reflecting the confidence in higher vocational colleges in new energy vehicles. In recent years, due to the support of the policy, The production and sales of New energy vehicles in China have risen in a row. In 2020, under the background of the decline in global automobile production and sales, the sales of New energy vehicles in China reached 1.367 million units, with a year-on-year increase of 43%, which has injected

strong confidence for higher vocational colleges to set up new energy vehicle technology majors. At the same time, The development of intelligent connected vehicles for China was rapid. In 2020, the sales volume of intelligent connected vehicles at/above L2 level in China will reach 3 million, and the market penetration rate will exceed 15%, which makes the demand for intelligent connected vehicle skills soar. Higher vocational colleges responded quickly, and the number of automobile intelligent technology majors increased from 8 in 2016 to 118 in 2020, with a compound growth rate of 96%. It is believed that it will maintain a high growth in the next five years.

The "Catalog of Vocational Education Majors (2021)" has been issued on March 12, 2021. This catalog has made adjustments to automobile majors, including merger, name change, addition, retention, deletion and so on see Table 2 for detail.

Table 2. Comparison table of new and original automobile majors in higher Vocational education

Major code	Original Major code	Major code	Original Major code
460701	560701	460705	560704
	560702		560706
	560705	500210	630702
460702	560707	500211	600209
460703	560703		600210
460704	/		600211
510107	610107	500212	600212

460701: Automobile manufacturing and test technology; 460701: New energy vehicle technology; 460703: Automobile electronic technology; 460704: Intelligent connected vehicle technology; 460705: Automobile modelling and modification technology; 500210: Automobile technical services and marketing;500211: Automobile Maintenance & Detection ;500212: New energy vehicle detection and maintenance technology;510107: Automobile intelligent technology.

According to the latest major code, the major record query situation of higher vocational colleges is shown in Figure 1.

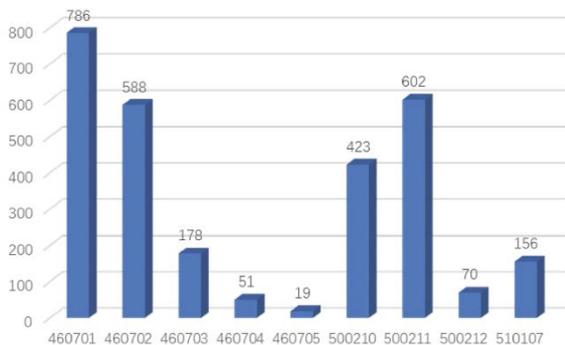


Figure 1 Automobile major registration in higher Vocational colleges in 2021

It can be found that the number of Automobile manufacturing and test technology records continues to decrease, new energy vehicle technologies maintain rapid growth, automobile intelligent technology maintain growth, intelligent connected vehicle technology has been recorded 51, it is believed that there will be a significant increase in 2022.

3. THE CHALLENGE OF MAJOR CONSTRUCTION IN HIGHER VOCATIONAL COLLEGES

3.1 The majors-group architecture is not reasonable

The concept of "majors-group" and the way of majors setting had been widely used in higher vocational colleges. The automobile majors in higher vocational colleges should take the relevant job groups of the

automobile industry as the target, optimize their own layout, drive related majors, extend related majors in the vertical and horizontal dimensions or integrate with related majors to a systematic majors-group with distinctive characteristics. Due to the rapid development of the automobile industry, it is difficult for some universities to complete the optimization and adjustment of their majors timely. The main problems are as follows:

3.1.1 The major construction ideas not clear professional

Construction thought is the soul of professional development [3]. The construction of professional group is a systematic project, which needs to consider many factors and is extremely complicated. Only after the existing professional setting, teacher team, teaching mode, course resources, training base and other elements, can we make full use of the existing advantages of the major and systematically integrate resources to carry out the construction of professional group.

3.1.2 A professional for unbalanced and scale of imbalance

At present, the new energy automotive technology, marketing and service, and maintenance of automobile application technology, automobile inspection and maintenance and other professional to open more, recruitment of students scale is larger, for the number of vehicles, such as smart technology emerging professional offer will not be enough to meet the market demand for the professionals.

3.1.3. Major set up lack of scientific demonstration and guidance

As one of the important pillars industry of the domestic automobile industry, the demand for skill talents is enormous. In order to promote employment, some colleges and universities blindly apply for hot majors related to automobile without relevant conditions, resulting in a surge in the number of automobile graduates and a decline in their qualities, but causing employment pressure. On the other hand, the market demand research is insufficient, some majors in good employment prospects did not get enough to declare, fill in fewer students. Some professional training to supply surplus, graduates counterpart employment rate is low, high transfer rate, resulting in training supply and market to demand contradiction.

3.2 Lack of experience in new major construction

3.2.1. The new professional jobs goals are not clear

The principal goal of vocational education is employment, higher vocational colleges should be based on social position requirements, accurate positioning specialized training goal. In this year a new intelligent snatched automobile technology, for example, there is no clear goal, social demand for the vocational ability did not reach consensus, thus it is difficult to determine the training objectives of relatively stable. The standards of teaching and curriculum system is likely to change as the technology development.

3.2.2. Lack of mature talent cultivation system

With intelligent snatched, electric, car sharing, the development of lightweight, the industry is in urgent need of interdisciplinary talents. Although higher vocational colleges have successively set up majors such as automobile intelligent technology and intelligent connected automobile technology, the corresponding talent training has not yet formed a mature systematic system [4]. On the one hand, the number of colleges and universities opening new majors is insufficient, and the number of talents training is difficult to fill the gap between talent demands in the industry. On the other hand, the mechanism of talent training is not perfect, the core curriculum of the major deviates from the demand of talent knowledge structure, the practical ability of graduates is insufficient, the knowledge update and iteration of colleges and universities is slow, and the lack of key technical personnel makes the quality of talents trained by colleges and universities difficult to meet the demand of the industry, and exacerbates the imbalance between the supply and demand of talents in this field.

3.2.3. The connotation of the professional setting is not clear

For a long time, the regular higher education in our country, often be evaluated by the standards of vocational education, There are some problems, such as attaching importance to academic qualifications, neglecting skills, attaching importance to theory and neglecting practice. Higher vocational colleges, teachers and students, and employers have different understandings of the connotation of talent training, which results in certain deviations in the orientation of talent training objectives. With the development of the automobile industry, the demand for skilled personnel is changing into the professional and versatile talents. Under the new situation, colleges and universities have not considered clearly what students want to learn, what enterprises need, and what colleges and universities should provide.

Some vocational colleges' training programs and curriculum systems follow the traditional ones, with too many compulsory courses and too few elective courses, which cannot meet the diverse needs of students and enterprises.

3.2.4. Lack of college-enterprise cooperation

Vocational colleges have a strong employment-oriented talent training, and usually cooperate with relevant enterprises to train students through school-enterprise cooperation. This mode is convenient for students' employment and solves the problem of graduates' job hunting. The premise for colleges to open new majors is to conduct in-depth industry, occupation and post research and analysis. If the running of higher vocational colleges lacks the participation in enterprises and industries, talent training is like water without a source or a tree without roots [5]. Only through cooperation with enterprises can the school understand the demand dynamics of the industry and master the latest new energy vehicle technology, intelligent vehicle technology and Internet of vehicles technology. At present, suppliers related to new energy and intelligent vehicles have not been recognized on a large scale in the market, and related technologies are updated quickly. In addition, due to geographical limitations, it is difficult for the college to find suitable enterprises to cooperate with them [6].

3.3 Insufficient supporting resources

3.3.1. Lagging teacher construction

The faculty is a necessary condition to ensure the major development of higher vocational colleges. Teachers play a leading role in the teaching activities of higher vocational colleges. There is big difference between teachers of higher vocational colleges and high school at teachers' welfare and social recognition, it is not conducive to attract high-level personnel, result in the shortage of teachers in higher vocational colleges, especially in smart new energy vehicles, which become a bottleneck restricting the development of higher vocational major [7]. At present, the composition of the teaching staff of automobile major in higher vocational colleges exists the phenomenon of the coexistence of old and young teachers, including the graduates of master's degree and doctoral degree, as well as the older senior teachers. Senior teachers have been engaged in teaching work for a long time with rich teaching experience, but there are some problems such as sticking to rules, knowledge structure not adapting to new needs, and low polarity of teaching reform. Master and doctoral graduates have a solid theoretical foundation, but they rarely get in touch with real automobile production and maintenance sites. Due to their lack of practical experience, it is inevitable for them to pay more attention

to theory than practice in teaching, which affects the teaching effect [8,9].

3.3.2. The teaching material is outdated and the teaching method is simple

Teaching material is the foundation, teachers need to rely on the teaching material, using appropriate teaching methods to help students learn the teaching material content, realize the teaching goal. The reality is that part of the college curriculum system reform progress is slow, old teaching materials, not in a timely manner to the industry into new technology, in the teaching material, teachers failed to reasonable use of teaching resources, the distribution of the students are difficult to deep theory knowledge and applied to the practice on digestion and absorption, students lack the learning enthusiasm, can't meet the needs of vocational education. In teaching activities, the teacher failed to follow the students' cognitive law, give priority to with the traditional teaching method, teachers blindly infusion book knowledge to the students, the lack of connection between knowledge and practice, does not reflect the true production environment and task, unable to mobilize the students' interest in learning, the cultivation of students' lack of practical ability, and it is difficult to quickly adapt to working after graduation.

3.3.3. The training conditions do not match the professional development

With the influence of higher vocational college enrolment expansion, funding constraints and other factors, the existing training conditions in higher vocational colleges are difficult to meet the training requirements. First of all, the training courses are not standardized, the training projects do not match the needs of professional posts, resulting in the lack of preciseness and scientific of teaching assessment. Secondly, the number of training teachers is insufficient, the training teachers fail to combine theoretical knowledge with practical skills, and the professional quality needs to be improved [10]. Finally, in the traditional training teaching, affected by the cost, the training equipment is often bulky, incomplete function and poor teaching effect [11,12]. For the emerging majors such as intelligent connected vehicles and new energy vehicles, most colleges and universities do not have training rooms, and there is few training equipment. So, it is difficult to support the real vehicle operation tasks.

4. THE ESTABLISHMENT AND DEVELOPMENT OF AUTOMOBILE MAJOR IN HIGHER VOCATIONAL COLLEGES

4.1 Deepen the reform of vocational education evaluation

In 2019, the notice of the State Council on printing and distributing the implementation plan of national vocational education reform clearly stated, "vocational education and general education are two different types of education and have the same important status." This position is emphasized on Article 3 of the amendments to the Vocational Education Law of the people's Republic of China (Draft for comments). Higher vocational colleges should deeply understand and implement the national deployment of vocational education, follow the educational law, reverse the unscientific orientation of educational evaluation, promote the reform of educational evaluation, develop quality education, and cultivate socialist builders and successors with all-round development of morality, intelligence, physique, beauty, and labour.

4.2 Elaborate professional top-level design

Higher vocational colleges should adhere to the guidance of serving development and promoting employment. On March 22, 2021, the Ministry of Education issued the major catalog of Vocational Education (2021), which provides a basis on setting majors, recruiting students and statistical information in higher vocational colleges. Employers can refer to the professional catalog to select graduates.

All colleges and universities should take serving the economic and social development as the starting point, plan their positioning in the national pattern of similar majors, meet the needs of job groups, clarify the relationship between industries, occupations, posts and majors, take innovative and pragmatic measures, timely make up their weaknesses, highlight the creation of major groups of advantages and characteristics, and form development advantages with distinctive regional characteristics and industrial background [13].

4.3 Continue to promote the "Three education reform"

As the central link between the teaching process, teachers, teaching materials and teaching methods have some prominent problems under the background of automobile industry in the new era. Carrying out the "three education reform" is a problem that all vocational colleges have to face. In view of the current shortage of high-level double qualified teachers in higher vocational colleges, vocational colleges should establish

mechanisms such as teacher training, talent introduction and part-time teachers, so as promoting existing teachers to master new knowledge, adapt to new directions, and improve teachers' information-based teaching level and comprehensive ability; Introduce and retain high-level talents for many aspects, such as providing favourable salaries, improving welfare benefits and broadening career development channels, so as injecting fresh blood into the teaching staff; Build an accommodation platform for colleges-enterprises and colleges-teachers to realize teacher sharing [14]. In terms of teaching materials, all vocational colleges should speed up the reform and innovation of teaching materials according to the requirements of the national vocational education reform implementation plan. It is suggested that colleges and universities cooperate with vocational education experts, technical experts in professional fields to develop leading teaching materials; In terms of teaching methods, we should keep up with the pace of development of the times, make comprehensive use of project-based teaching methods and action oriented teaching methods, timely introduce information-based teaching means, introduce intelligent teaching elements such as VR/AR virtual reality combination into the classroom, expand teaching space, enhance students' learning experience and interactivity, and innovate and integrate three-dimensional teaching materials and information-based teaching methods, More effectively mobilize the polarity of students' learning.

4.4 Construction of training room and development of training equipment

The training room embodies the vocational attribute of vocational education and is the cornerstone of realizing the educational concept of "integrated teaching". Vocational colleges should pay attention to the construction of training room. The elements of the training room include training scheme, training teacher, training site, training equipment, etc. For new energy vehicle technology, automotive intelligent technology, intelligent connected vehicle technology and other emerging majors in recent years, there are many problems to be solved, such as lack of training schemes, shortage of training teachers, inadequate training venues, training equipment and training funds. Higher vocational colleges should formulate standardized teaching standards for practical training courses, strengthen the training of training teachers, and improve teachers' ability to guide practical training courses. In terms of training equipment, we can make use of the self-owned funds of colleges and universities, and also through the cooperation and joint construction of colleges and enterprises, where colleges and teachers, enterprises provide equipment and corresponding technical experts, and make full use of the respective favourable conditions of colleges and enterprises to cooperate and share training resources.

4.5 Strengthen the integration of industry and education and college enterprise cooperation

In 2014, the State Council issued the State Council on accelerating the development of modern vocational education, which reflected the concept of "integration of industry and education" on the national level document for the first time [15]. In November 2020, the proposal of the Central Committee of the Communist Party of China on formulating the 14th five-year plans for national economics, and social development, and the long-term goal of 2035 clearly proposed to increase the human investment in Vocational and technical education, enhance its adaptability, explore the modern apprenticeship system with Chinese characteristics, strengthen the cooperation between colleges and enterprises, promote the integration of industry and education, and vigorously cultivate technical and skilled talents [16]. Higher vocational colleges should deeply integrate vocational education and productive labor, vigorously promote modern apprenticeship, optimize the relationship between school education and enterprises, and combine colleges, governments, industries and enterprises to formulate adaptable talent training programs. Mapping major construction with industrial demand, connecting talent training for employment system, innovating education mode in Colleges and universities, providing resource supports for enterprises, cooperative innovation, breaking through barriers to the development of industry, college and research, and implementing talent training in an all-round way.

4.6 Improve the system and provide guarantee

The sustainable development of majors in higher vocational colleges is inseparable from the strong guarantee of system. Vocational colleges can develop the automobile related majors according to the construction idea of major group. The major construction of Higher Vocational Colleges usually take the secondary colleges as the main body, the secondary colleges have a strong voice in professional governance. Many majors are intercollegiate, which requires the formation of interring college cooperative major groups, the construction of think tanks and the establishment of professional group steering committees. The steering committee shall hold meetings on a regular basis or according to actual needs to explore ideas and plans for the construction of major groups. Secondly, we should establish a systematic guarantee system, which should cover various necessary rules and regulations, capital investment scheme, quality management system and so on. In addition, we should continue to standardize the operation and management of major groups of Higher Vocational Colleges by establishing systems covering curriculum setting and adjustment, teaching organization and implementation, construction and operation of experimental training room and so on. In addition, sufficient funds are a powerful

guarantee of the sustainable development of major construction. It is necessary to broaden the fund channels and strengthen the planning and supervision of the use of funds to ensure the reasonable and compliant application of funds. Employment quality is an important evaluation of the effectiveness of the construction of major groups. To evaluate vocational education, we should establish a dynamic adjustment mechanism, focus on the evaluation of employment quality, continue to investigate and track, and constantly optimize the construction and development plans for major groups.

5. CONCLUSION

The transformation and upgrading of the automotive industry and industrial reform have brought new demand for automotive talents. Vocational colleges constantly adjust and optimize major settings and improve the training quality of graduates in order to adapt to the development of industry. The catalog of Vocational Education Majors (2021) issued this year is of great guiding significance of guiding local governments and schools to better adapt to the needs of economic structure adjustment and industrial upgrading. It is suggested that all vocational colleges continue to interpret the new catalog, continue to expand and strengthen characteristic majors and set up new majors according to their actual conditions, In particular, we should focus on the new majors such as new energy vehicle technology, intelligent connected vehicle technology and automobile intelligent technology in recent years, so as training and transport more industry intelligent and connected technical talents for the automobile industry.

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