

# Construction and implementation of curriculum system for new energy vehicles in secondary vocational schools under the background of 1 + X certificate

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**Abstract:** in order to better implement the pilot work of the 1+x vocational skill level certificate, relying on the development of the new energy vehicle industry in the region, taking the current popular major in Secondary Vocational Colleges -- new energy vehicle application and maintenance major as an example, by reconstructing the curriculum system of new energy vehicle major, Explore the establishment method to solve the corresponding relationship between professional curriculum system and vocational skill level certificate.

**Key words:** 1+x certificate; Major in new energy vehicles; Curriculum system

## 1 Overview

In January, 2019, the State Council issued the implementation plan of national vocational education reform and started the pilot work of 1+x certificate system. In March 2019, the Ministry of Education announced the first batch of 1+x certificate pilot evaluation organizations, and the 1+x vocational skill level certificate and related standards for intelligent new energy vehicles were issued by Beijing CRRC High Tech Co., Ltd.

Although the integration of 1 + X certificate system into professional talent training programs and courses has become the theme of the current reform and practice of secondary vocational education. However, how to practice is still the focus of most pilot colleges and universities, and also the focus of the development and research of secondary vocational education.

## 2 Research status

As of November 2022, the author has retrieved a total of 4047 articles on CNKI with the keyword of "1 + X certificate system" and 615 articles with the keyword of "course certificate integration". After the Ministry of Education issued a document on "1+x certificate system" in 2019, many experts and scholars in China have studied "course certificate integration". It is worth noting that of the hundreds of documents, only 33 take automobile related majors as an example. After intensive reading of these documents, it is found that the research objects of experts and scholars are mainly higher vocational colleges.

总体趋势分析

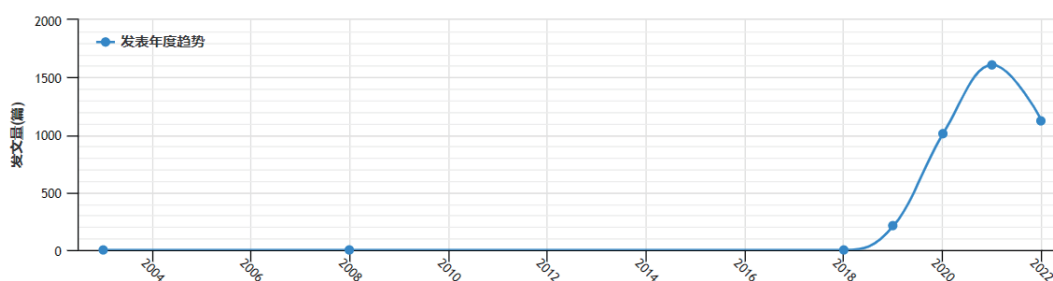


Figure 1: overall trend analysis of the number of papers retrieved with the theme of "1+x system"

According to the report provided by Beijing CRRC High Tech Co., Ltd., the first batch of 1+ x certificate system pilot vocational education and training evaluation organization in the automotive field of the Ministry of education, in 2019, 900 cooperative colleges and universities nationwide applied for CRRC 1+x certification, with a total of more than 80000 people applying for certification and more than 30000 people certified; In 2021, 1417 cooperative colleges and universities nationwide applied for CRRC 1+x certification, with a total of 300000 applications and 130000 certifications; In the first four months of 2022, more than 730 pilot colleges and universities were declared, with 39923 people. Colleges and universities across the country have applied for 340000 applications and certified 130000. It can be seen that the nationwide 1+x certificate certification work is in progress.

## 3 Professional construction background and objectives

China's new energy vehicles have a strong momentum of development, entering a new stage of accelerated development, showing

a sustained high-speed growth trend, ranking first in the world for seven consecutive years. Driven by both policy support and growing market demand, the sales of domestic new energy vehicles have reached record highs, and their advantages in the global new energy market have also been expanding. At present, a large number of posts in China's new energy vehicle manufacturing enterprises are maintenance workers and after-sales service personnel, and most of these posts are deployed from the original traditional vehicle maintenance enterprises. They do not have a deep grasp of the technology of new energy vehicles, and are difficult to apply new technologies, new processes, new specifications and digital technologies. Therefore, enterprises have high expectations for new energy vehicle students who are about to enter, which can be equivalent to the use of mature skilled talents, shorten the training adaptation period at the time of entry, and make it easier to accept the new technology of new energy vehicles. Our school meets the new requirements of post market service posts (groups) for new energy vehicles, and cultivates high-quality workers and technical talents who can be engaged in the maintenance of new energy vehicles, the maintenance of three electric systems of new energy vehicles, and the maintenance and reception of new energy vehicles.

According to the current employment situation, the work content includes but is not limited to: the assembly of new energy vehicle harness; PDI quality inspection of new energy vehicle ex warehouse; Regular maintenance of new energy vehicles; Replacement of high voltage components of new energy vehicles; Whole vehicle circuit maintenance of new energy vehicles; Replacement of power battery failure module of new energy vehicles; Installation, adjustment and maintenance of charging equipment for new energy vehicles, etc. In addition, it also includes some related positions of intelligent connected vehicles, such as calibration of binocular cameras, operation and maintenance of campus intelligent cars, etc. Of course, it also includes new energy vehicle sales, new energy vehicle insurance and other jobs.

#### 4 Investigation on professional standards of new energy vehicle industry in the region

In recent years, Dongguan has accumulated advantages in key core parts of new energy vehicles by virtue of its complete industrial chain and strong manufacturing base. Dongguan new energy vehicles have formed an industrial chain of vehicle production and "three electricity" (power battery, electromechanical and electronic control), and lithium battery packs and electronic components, glass, tires, hardware and other components have a certain foundation. In 2021, new energy was listed as one of the seven strategic emerging industries in Dongguan. In 2022, Dongguan development and Reform Bureau released the "14th five year plan" for Dongguan's automotive energy infrastructure. According to the plan, by 2025, Dongguan willNew energy vehiclesThe total number of vehicles will reach 220000, and all kinds of vehiclesCharging pointThe total number reached 120000, Hydrogenation stationUp to 29. The sales of new energy vehicles are increasing year by year. By 2025, the sales of new energy vehicles will account for 22% of the city's auto sales, which is higher than the national goal of achieving 20% of the new car market by 2025. Dongguan is the core city of Dawan District in the Pearl River Delta, and our school is located in the Songshan Lake area, the core science and technology area of Dongguan, with a superior geographical location. The International Automobile City and the International Automobile Parts City are only 2 kilometers away from our school. Relying on the platform innovation advantages, Songshan Lake has strong competitiveness in the fields of power batteries, electronic control systems and intelligent connected vehicles. Huawei has targeted 14/15 automatic driving technology and started the technology research and industrial application project of intelligent vehicle computing and communication infrastructure platform. Whether from the perspective of local policies or geographical location, the major of new energy vehicle application and maintenance has significant advantages in running our school.

**Table I Research on the job of technical and skilled talents in the new energy vehicle industry**

Position type	Job orientation	Professional competence
Initial employment post	New energy vehicle power battery tester	Ability of safe operation of high-voltage system, detection and maintenance of power battery of new energy vehicles
	New energy vehicle drive motor and control system installer	The ability of safe operation of high-voltage system and the ability of inspection and maintenance of drive motor and control system of new energy vehicles
	New energy vehicle performance tester	Ability to master standard performance parameters, safe operation of high-voltage system, performance detection and troubleshooting of new energy vehicles
	New energy vehicle maintenance personnel	Ability of safe operation of high-voltage system, performance detection and troubleshooting of new energy vehicles
	New energy vehicle 4S shop maintenance reception	The ability to master reception etiquette, the cognition of new energy vehicles, and the performance testing ability of new energy vehicles

Expand employment post	Maintenance personnel of new energy vehicle service (charging point)	Ability of new energy vehicle charging system maintenance and AC / DC charging pile maintenance
	New energy vehicle on-board network maintainer	New energy vehicle on-board terminal and intelligent Internet connected vehicle maintenance capability
	Technical service consultant for new energy vehicles	Performance testing capability of new energy vehicles
	New energy vehicle salesman	Sales and technical services of new energy vehicles
Development post	Technical manager of new energy vehicle service	New energy vehicle performance testing capability, new energy vehicle technology comparison and optimization capability
	Managers of new energy vehicle aftermarket Enterprises	Ability of enterprise management and communication
	Senior managers of small and medium-sized enterprises	The ability of enterprise management and the ability of predicting the development of new energy vehicle industry

### 5 Professional curriculum system docking vocational skill level certificate

Secondary vocational students are unable to complete the learning of all contents due to learning time, professional foundation and other reasons, so they need to select typical work tasks of vocational skill level certificate (primary) and integrate them into the corresponding courses. As shown in the figure below, the connection between the three core modules of the smart new energy vocational skill level certificate and the core curriculum system of the new energy vehicle technology specialty

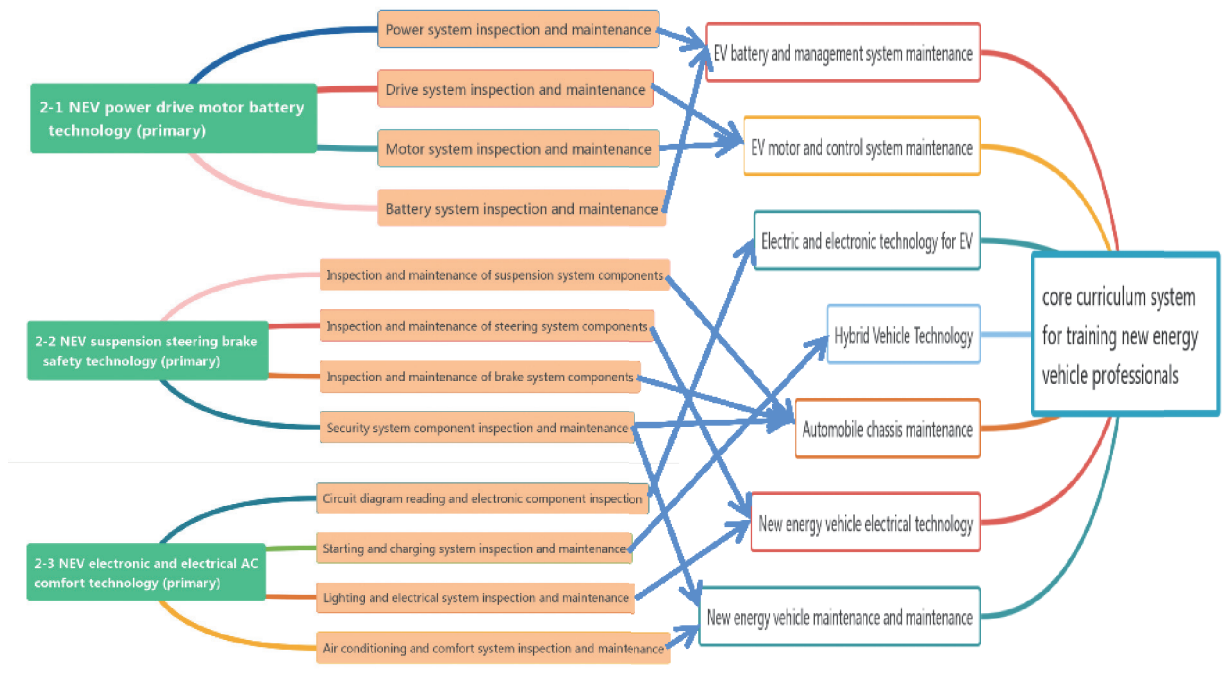


Figure 2: the docking relationship between the smart new energy vocational skill level certificate and the core curriculum system of new energy automobile major

### 6 Learning task docking work task

Table II Docking of vocational skill level standards and curriculum standards

Vocational skill level standard			criterion for curriculum		
certificate	Work tasks	Vocational skills	Learning content	learning tasks	Study area / course

Battery technology for power drive motor of new energy vehicles (primary)	Task 1: work safety and preparation for new energy vehicles	1.1. safety precautions	1Daily workshop safety regulations, safety production specifications and 6S.	Task 1: work safety of new energy vehicles	Maintenance of new energy vehicles
		1.2. precautions for use of tools and equipment	2. usage and use specification of maintenance tools and use of hoists.		
		1.3. preparations for vehicle maintenance	3. vehicle maintenance preparation and filling method of maintenance work order.		
		1.4. high voltage safety protection measures	4Inspection and use of high-voltage protective equipment and safety of high-voltage operation.		
		1.5. safety code for high voltage electrical operation	5Structure and function of high-voltage components, high-voltage power failure and inspection, tool use.		
			6.Establishment of safety awareness of high voltage operation		
1.6. precautions for maintenance operation	7.Inspection mode and precautions for operation of pure electric vehicles and hybrid electric vehicles. (check mode, remote key, high-voltage component anti Disposal of protective and maintenance switches and leakage treatment.)				

After the preliminary determination of the learning content, the content can be intercepted from multiple textbooks according to the learning content, forming a new loose leaf teaching aid for this course. The production of the new loose leaf teaching aid can not only meet the daily teaching needs, but also meet the needs of the corresponding module 1+x certificate assessment and guidance. The content of the new loose leaf teaching aid can be updated according to the 1+x certificate system - vocational skill level standard, or according to the development of new technologies, new processes, new equipment and new materials in the new energy vehicle industry. In the process of determining the learning content, it is not to mechanically apply vocational skills as the learning content directly, but to sort out the learning content that can give full play to the advantages of secondary vocational students by combining the characteristics of secondary vocational students' strong practical ability, skilled use of electronic products and interest in New things. In addition, in the process of professional course teaching, we should pay attention to the ideological and political education in professional teaching, gradually establish the safety consciousness and labor consciousness, and cultivate the craftsman spirit of secondary vocational students.

## 7 Conclusion

As the main body of the 1 + X certificate system pilot, vocational colleges actively promote the curriculum reform and the establishment of vocational education standards. But at the same time, we should also recognize that 1+x is in the initial pilot stage, and the standards and systems are constantly improving. In practice teaching, we overemphasize the process type operation skills, ignore the cultivation of application ability, and distort the principle of "necessary and sufficient" in theory teaching, reduce teaching requirements, so that students fail to master the necessary basic knowledge, Are not in line with the needs of social development and student development.

## References

- [1] Dan Li Exploration and Reflection on the curriculum system of new energy vehicles in secondary vocational schools [j]two thousand and twenty(23): 1
- [2] Jun Xie Construction and implementation of new energy vehicle technology professional curriculum system based on 1 + X certificate [j]Science and technology wind, 2021 (01): 75-76
- [3] Jun Lai, Kaihua Huang, Bing Lei Research on the construction of curriculum system of new energy vehicle major in secondary vocational schools under the "1 + X" certificate system -- Taking Guangxi electromechanical engineering school as an example [j]Guangxi Education, 2020 (26): 42-47
- [4] Shuai Zhao, Xiaopeng Li, Zheng Xu , Zhiguang Lin Research on the development of teaching resources for the application and maintenance of intelligent new energy vehicles in secondary vocational schools under the "1 + X" mode [j]Modernization of education, 2020,7 (26): 178-181
- [5] Jingqing Li Exploration on "course certificate integration" of secondary vocational new energy vehicle major under the "1 + X" certificate system [j] Guangxi Education, 2020 (18): 4
- [6] Meiting Huang Research on training course management of new energy vehicle technology specialty -- Taking "quality safety course" as an example [j] Internal combustion engines and accessories, 2021 (11): 2

- [7] Ronglin Lai On the development and curriculum system construction of new energy vehicle specialty in secondary vocational schools [j]Information weekly, 2019 (19): 1
- [8] Weidong Han Construction of curriculum system of new energy vehicle technology [j]Science and education guide - Electronic Version (early), 2021 (010): 000
- [9] Peiwen Chen Discussion on the construction of new energy vehicle specialty in secondary vocational schools [j]Information weekly, 2020 (8): 1
- [10] Wenru Xie Initiatives to integrate the 1+x Certificate Curriculum System of new energy vehicle major [j]Times auto, 2022 (18): 3
- [11] Dexiu Tang, Weijie Zhao Thoughts and attempts on the construction of a new curriculum system for the major of new energy vehicles "quickly build a knowledge framework and fill in the details of knowledge as needed" [c]// the 14th Annual Conference of Sichuan automotive sciencetwo thousand and twenty
- [12] Lirong Zhang Analysis on the construction of undergraduate course system of new energy vehicle technology specialty group [j]Automobile maintenance and repair, 2021 (16): 3
- [13] Yongjian Lan Research on curriculum reconstruction of Network Specialty under the background of 1 + X certificate [j]Fujian computer, 2022, 38 (1): 4
- [14] Xiaoji Liao Construction of work integrated learning talent training program for new energy vehicle technology specialty [j]Speed reading (first ten days), 2016, 000 (008): 116-116117
- [15] Bin Zhang Discussion on the construction of curriculum system for new energy vehicles [j]two thousand and nineteen(8) : 1

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