



Research and Practice on the Reform of Public Basic Courses for New Energy Vehicle Technology Majors in Chinese Japanese Cooperative Education under the New Standards of Vocational Education

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Abstract. This article specifically focuses on the reform of public basic courses for the new energy vehicle technology major of "Chinese Japanese Cooperative Education" in vocational colleges (the public basic courses in this article mainly refer to Chinese, mathematics, physical education, and aesthetic education courses). It analyzes the characteristics and some professional courses of the new energy vehicle technology major of "Chinese Japanese Cooperative Education" in vocational colleges, and combines the characteristics of Chinese, mathematics, physical education, and aesthetic education courses to conduct targeted curriculum reform research for the major. It analyzes the connection points and explains the close internal connection between Chinese, mathematics, physical education, and aesthetic education courses and the talent cultivation of the new energy vehicle technology major of "Chinese Japanese Cooperative Education" in vocational colleges, providing a reference basis and ideas for the development of specialized curriculum standards.

Keywords: Higher vocational education; Chinese Japanese cooperative education; Major in New Energy Vehicle Technology; Public basic courses.

1 Introduction

Chinese foreign cooperative education refers to the cooperation between foreign legal entities, individuals, and relevant international organizations, as well as educational institutions and other social organizations with legal personality in China, to establish educational institutions primarily targeting Chinese citizens within the territory of China, and to carry out educational and teaching activities.

Focusing on the key development of the new energy vehicle technology major in recent years, especially the Chinese Japanese cooperative education carried out around this major, this article combines its own public basic courses as the main background to conduct research on the new energy vehicle technology major in Chinese Japanese cooperative education.

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By consulting relevant materials, vocational schools mainly focus on their own professional characteristics in carrying out Chinese Japanese cooperative education. For example, Panjin Vocational and Technical College has partnered with the Chinese Japanese joint venture Xinhua Songshan Welfare Liaoning Health Company (starting from July 2022) to carry out Chinese Japanese teaching activities in disciplines, majors, courses, and other aspects with the "Smart Health and Elderly Care Service and Management" major as the entry point, cultivating highly recognized technical and skilled talents by the education departments of both China and Japan, and issuing graduation certificates for both schools [1]; Beijing Industrial Vocational and Technical College and Kyoto Computer College in Japan jointly hold a vocational education project for animation production technology [2]; Zibo Vocational College and YIC Kyoto University of Technology in Japan jointly hold a vocational education project for new energy vehicle technology majors [3]; Binzhou Vocational College collaborates with Japanese general organizations, vocational education support institutions, and school legal entity Harada Academy Kagoshima Medical Technology Specialized School to organize the Smart Health and Elderly Care Services and Management program [4].

This article focuses on the new energy vehicle technology major as the research object. Through consulting relevant materials, existing literature on the curriculum reform of vocational new energy vehicle technology majors mainly focuses on the reform of professional group curriculum system and the English curriculum reform in public basic courses (such as the construction and implementation of the "on-the-job course competition certificate" curriculum system for vocational new energy vehicle technology majors under the research 1+X certificate system of Shaanxi Defense Industry Vocational and Technical College (published in 2023) [5], and the research on the expansion of vocational English curriculum based on the "online offline hybrid" teaching mode at Shenmu Vocational and Technical College - taking the new energy vehicle technology major as an example (published in 2021) [6]. In addition to the English curriculum, the reform of public basic courses mostly adopts a focus on major categories or The research project on the reform of public basic courses, specifically aimed at the "Chinese Japanese Cooperation in Running Schools" of new energy vehicle technology majors in vocational colleges, is carried out according to the division of secondary colleges. The public basic courses in this article mainly refer to the "Chinese Japanese Cooperation in Running Schools" of new energy vehicle technology majors in vocational colleges At present, there is no literature available to conduct relevant research on the Chinese language, mathematics, physical education, and aesthetic education courses offered in the new energy vehicle technology major.

A comprehensive list of career orientations for new energy vehicle technology majors is shown in Table 1.

Table 1. List of Professional Positions in New Energy Vehicle Technology [7]

Major category	Professional category	Corresponding industries	Major Group	Main job categories (or technical fields)	Vocational Skills Level Certificate	Examples of Industry Enterprise Standards and Certificates
Equipment manufacturing category	Automotive manufacturing	Automobile manufacturing industry; Repair and maintenance of automobiles, motorcycles, etc	New energy vehicle manufacturing personnel; New energy vehicle maintenance personnel; New energy vehicle inspection and testing personnel	Manufacturing of new energy vehicles; Mechanical and electrical maintenance of new energy vehicles; New energy vehicle whole vehicle and component inspection, etc	1+X occupational level certificate for automotive assembly and adjustment workers, automotive application and maintenance (including intelligent new energy vehicles)	Toyota technicians and Toyota professional technicians (including new energy modules); BMW Electromechanical Level 1 Technician, BMW Electromechanical Level 2 Technician (including new energy modules), etc

Taking our school as an example, the training goal of the "Chinese Japanese Cooperation Education" new energy vehicle technology major is to introduce international high-quality teachers and teaching resources. The Chinese Japanese cooperation jointly cultivates talents who can adapt to the needs of global integration, the development of the new energy vehicle industry, and the needs of new energy vehicle and component manufacturing, maintenance services, and supporting services enterprises in the new energy vehicle industry. The goal is to cultivate well-rounded development with both moral and technical skills, possess relevant professional cultural literacy, good professional ethics, teamwork, and other professional qualities, master necessary cultural knowledge and basic theoretical knowledge of new energy vehicle technology, possess professional job abilities and technical skills in related fields, and target high-quality technical and skilled talents in the fields of new energy vehicle manufacturing, maintenance, and services. The quality specifications related to the public basic courses (Chinese, mathematics, physical education, and aesthetic education courses) mentioned in this article include: having a healthy physique, psychology, and a sound personality, mastering basic sports knowledge and one or two sports skills, cultivating good fitness and hygiene habits, and good behavioral habits; Having certain aesthetic and humanistic qualities. The knowledge specifications related to public basic courses include mastering essential scientific and cultural basic knowledge. The ability specifications related to public basic courses include: the ability to explore learning, lifelong learning, analyze problems, and solve problems; Has good language and writing skills, as well as communication skills. Based on the path of "from simplicity to complexity, with progressive abilities", combined with professional characteristics, teaching laws of higher vocational education, and sustainable development needs of stu-

dents, we have constructed a "platform progressive" curriculum system that integrates vocational skills certificate standards such as "1+X" in the automotive field, as well as international professional qualification standards in Japan, with abilities as the core.

The public basic courses studied in this article mainly refer to Chinese, mathematics, physical education, and aesthetic education courses in public compulsory courses. Due to the fact that Chinese Japanese cooperative education offers Japanese courses rather than English courses, and Japanese courses belong to professional courses rather than public basic courses, Japanese and English courses are not included in the research object here.

This article aims to explore the formation of a public basic curriculum (Chinese, Mathematics, Physical Education, and Aesthetic Education) standard and teaching resources for the "Chinese Japanese Cooperative Education" new energy vehicle technology major, which can be used as a reference for other schools to carry out the reform of public basic curriculum (Chinese, Mathematics, Physical Education, and Aesthetic Education) for the "Chinese Japanese Cooperative Education" new energy vehicle technology major.

2 Main content of the research

2.1 Research object

According to the Japanese automotive maintenance personnel qualification certification standards integrated into the "Chinese Japanese Cooperative Education" new energy vehicle technology major (group) courses in vocational colleges, public basic courses (referring to Chinese, mathematics, physical education, and aesthetic education courses) are redesigned for professional (group) courses, vocational technology and skills courses, and job requirements.

2.2 Overall framework

This article has designed Overall framework of curriculum reform in Chinese, mathematics, physical education, and aesthetic education based on the actual situation in Table 2 as follows.

Table 2. Overall framework of curriculum reform in Chinese, mathematics, physical education, and aesthetic education [8]

The New Energy Vehicle Technology Major of "Chinese Japanese Cooperative Education" in Higher Vocational Education under the New Standards of Vocational Education			
Reform of Public Basic Curriculum			
chinese curriculum reform	mathematics curriculum reform	Physical Education Curriculum Reform	Reform of Art Education Curriculum

2.3 Research entry point

The starting point of the research is to form a curriculum system for the reform of public basic courses (Chinese, mathematics, physical education, and aesthetic education) in the Chinese Japanese cooperative education of new energy vehicle technology majors under the new standards of vocational education, as well as a set of valuable design materials (curriculum standards, teaching plans, lesson plans, and courseware for public basic courses).

Starting from the national teaching standard system of vocational education, this study explores the curriculum standards for the public basic courses of the New Energy Vehicle Technology major (specialized and characteristic) in Chinese Japanese cooperative education.

2.4 The main issues and important viewpoints of the research

The main issue of the research is the construction of the curriculum system for the reform of public basic courses (Chinese, mathematics, physical education, and aesthetic education) in the Chinese Japanese cooperative education of new energy vehicle technology (specialized and characteristic) under the new standards of vocational education, as well as the design of curriculum standards/teaching plans/lesson plans/courseware.

The professionalization and professionalization of talent cultivation in vocational colleges require research on curriculum reform in specific fields. Therefore, this article chooses to conduct research in the field of new energy vehicles, which combines the characteristics of our school and focuses on industry development.

3 Research methods, means, approaches

Researching new policies and standards for vocational education, taking the national teaching standard system for vocational education as the research entry point, based on the professional teaching standards for new energy vehicle technology majors in automotive manufacturing in higher vocational schools, and collaborating with professional colleges and Chinese Japanese cooperative education units, we will carry out research on the reform of public basic courses (Chinese, mathematics, physical education, and aesthetic education) with professional effectiveness and distinctive characteristics around the integration of industry and education and Chinese Japanese cooperative education.

Specific ideas: Collaborate with secondary colleges and professional teaching and research offices to carry out teaching and research activities, and form a public basic course system and resources specifically designed for Chinese Japanese cooperative education majors and employment positions. The course teaching content emphasizes content integration and highlights teaching characteristics. Namely, based on the new standards of vocational education, grasping the connotation of disciplines, closely adhering to professional needs, and taking into account the characteristics of enter-

prises, we will construct a public basic curriculum system suitable for Chinese Japanese cooperative education in the field of new energy vehicle technology.

(1) Comparative research method

Collect the practices and experiences of the public basic curriculum reform of the new energy vehicle technology major under the Chinese Japanese cooperative education program from other schools, and provide reference and inspiration for this study.

For example, in 2019, Zibo Vocational College launched the first Chinese foreign cooperative education project for the new energy vehicle technology major in China [9]. The project adopts an international talent training model, and the professional settings are aligned with the international needs of the automotive industry. The course content is effectively aligned with new energy vehicle technologies, and the teaching standards are aligned with the professional standards of Japanese maintenance personnel. Students study in China for three years. In their freshman year, they study Japanese and basic professional courses. In their sophomore year, they study Japanese and core courses in new energy vehicle technology. In their junior year, they study new energy vehicle technology courses, and conduct comprehensive practical training and on-the-job internships. After graduation, one can choose to continue studying in Japan for two years and obtain the qualification certificate for automatic vehicle maintenance certified by the Japanese Ministry of Transportation. Among them, information on the reform of public basic courses has not yet been found.

(2) Career oriented approach

According to the Japanese automotive maintenance personnel qualification certification standards integrated into the "Chinese Japanese Cooperative Education" new energy vehicle technology major (group) courses in vocational colleges, public basic courses are redesigned for professional (group) courses, vocational technology and skills courses, and job requirements.

(3) Empirical research method

Empirical research will be conducted based on the actual situation of the new energy vehicle technology major classes under the specific Chinese Japanese cooperative education program, including the study of senior and junior class students.

4 Innovation points and application prospects

Innovation point: Specialized in the reform and research of public basic courses (the public basic courses in this project mainly refer to Chinese, mathematics, physical education, and aesthetic education) for the "Chinese Japanese Cooperative Education" new energy vehicle technology major in vocational colleges, forming a targeted curriculum system, curriculum standards, and related teaching resources.

Application prospects: The proposed reform of the curriculum system, curriculum standards, and related teaching resources for the public basic courses (Chinese, mathematics, physical education, and aesthetic education courses) of the "Chinese Japanese Cooperative Education" new energy vehicle technology major can be used as a reference for relevant universities to carry out the reform of the public basic courses (Chinese, mathematics, physical education, and aesthetic education courses) of the

"Chinese Japanese Cooperative Education" new energy vehicle technology major, as well as for the reform of public basic courses in other majors of the "Chinese Japanese Cooperative Education" or for other related work of "Chinese foreign cooperative education" (such as Chinese Russian cooperative education, Chinese Thai cooperative education, etc.).

5 Research situation and future work

This article combines the characteristics of Chinese language, mathematics, physical education, and aesthetic education courses with the courses "High Voltage Safety and Protection of New Energy Vehicles" [10], "Inspection of Automotive Electronic Control Systems", "Construction and Maintenance of Hybrid Electric Vehicles", "Safety and Comfort Systems of Vehicles" [11], and "Introduction to Advanced Automotive Technology" [12] in the Chinese Japanese cooperative education program for the new energy vehicle technology major. It explores their integration points and highlights the service of Chinese language, mathematics, physical education, and aesthetic education courses for the talent cultivation of the Chinese Japanese cooperative education program.

Chinese language courses usually aim to cultivate students' listening, speaking, reading, and writing abilities, including vocabulary accumulation, understanding of grammatical structures, reading comprehension, and writing skills. Emphasize the communicative function of language to help students effectively communicate in daily life and academic fields. In addition, Chinese language courses also include the study of literary works to enhance students' cultural literacy and critical thinking abilities. For example, when reading professional literature related to new energy vehicles, good reading comprehension skills can help students better understand the technical details and principles involved. Meanwhile, good writing skills can also help students make it easier to write experimental reports or papers. The cultural literacy and humanistic care in Chinese language courses also help cultivate students' comprehensive qualities, enabling them to maintain attention and reflection on human society, environment, ethics, and other aspects while learning technology.

The mathematics course focuses on the cultivation of logical thinking and problem-solving skills, involving the operation of numbers and symbols, understanding of geometric shapes, analysis of statistics and probability, as well as algebra and calculus. Mathematics courses encourage students to understand mathematical principles through exploration and discovery, and apply these principles to solve practical problems. The current mathematics teaching focuses more on interdisciplinary integration and the application of mathematics in student majors. Mathematical modeling is a bridge connecting mathematics and majors, and a powerful tool for combining mathematics and majors. In practical teaching, it can permeate and integrate problem driven mathematical modeling teaching in Chinese Japanese cooperative education for new energy vehicle technology majors. For example, for the professional course "Electronic Control System Inspection of Cars", the control accuracy of cars in "driving", "turning", and "parking" is controlled by microcomputer electronic control. Stu-

dents need to learn the electronic control technology and fault diagnosis technology of cars, including oscilloscopes, car fault diagnosis, linear signal sensors, frequency signal sensors, power battery pack battery module charging and discharging, and capacity balancing, which are closely related to mathematics and involve mathematical modeling, functions, linear algebra, nonlinear errors, filtering, Fourier analysis, and differential equations.

Physical education courses aim to improve students' physical health and athletic skills, while also cultivating teamwork and competitive spirit. Including various sports and physical activities such as football, basketball, badminton, table tennis, volleyball, tennis, as well as aerobics and physical training. Physical education courses may incorporate elements of aesthetic education, such as using aerobics teaching to enhance students' personal temperament and confidence. Japanese automotive maintenance personnel play an important role in cultivating students' comprehensive qualities and adapting to future career challenges. For automotive maintenance personnel, they need to pass specialized qualification certification, divided into multiple levels such as Level 1, Level 2, and Level 3. The higher the level, the greater the technical level and responsibility. Their work is not limited to automotive repair shops or 4S stores, but can also work in second-hand car stores, modification stores, automotive parts stores, vehicle rental companies, racing teams, R&D departments of host factories, airports, insurance companies, and other places. They may also include various high-intensity and harsh environments, requiring good physical fitness.

The aesthetic education curriculum focuses on cultivating artistic perception and creativity, including music, dance, and more. These courses encourage students to express their emotions and imagination, while also improving their aesthetic appreciation abilities. Art education teaching includes the analysis of artistic works, the study of artistic techniques, and the practice of artistic creation. Aesthetic education is considered a crucial part of quality education and should receive more attention and implementation. For example, in the teaching content of the professional course "Introduction to Advanced Automotive Technology", "The History and Development of the Automotive Industry" can be infused with aesthetic education elements, or in other words, it can search for aesthetic education elements from the history and development of the automotive industry, showcasing the development process of the automotive industry driven by people's pursuit of beauty. Regarding the automotive maintenance in the new energy vehicle technology major of Chinese Japanese cooperative education, it also involves aesthetic education, because automotive maintenance not only relates to the practicality of vehicles, but also involves the appearance and interior of vehicles. Good maintenance can make the appearance of vehicles more beautiful and the interior more comfortable, thereby improving the passenger experience. In addition, the meticulous work and attention to details during the car maintenance process are also manifestations of aesthetic education, which cultivates people's perception and pursuit of beauty.

In the future, we need to strengthen in-depth research on new energy vehicle technology [13][14][15] and actively carry out enterprise practice.

6 Conclusions

Through research, it has been found that Chinese language, mathematics, physical education, and aesthetic education courses are closely related to the Chinese Japanese cooperative education of new energy vehicle technology majors. By carrying out curriculum reform and collaborating with professional course teachers and part-time teachers in Japan, the curriculum standards of Chinese language, mathematics, physical education, and aesthetic education courses have been revised to better promote meeting the certification standards for automotive maintenance personnel. The effectiveness evaluation mechanism of the reformed Chinese language, mathematics, physical education, and aesthetic education courses in achieving the certification standards for automotive maintenance personnel and promoting the future career development of students has also been studied.

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