



Exploring and Analyzing the Construction Measures of the Curriculum System of Aero-engine Manufacturing Technology Specialty in Higher Vocational Colleges Based on Employment Orientation

Moqi Li*, Andi Huang, Wei Huang

Hunan Automotive Engineering Vocational College, Zhuzhou 412000, Hunan, China.

How to cite this paper: Moqi Li, Andi Huang, Wei Huang. (2025). Exploring and Analyzing the Construction Measures of the Curriculum System of Aero-engine Manufacturing Technology Specialty in Higher Vocational Colleges Based on Employment Orientation, *Aerospace and Aeronautical Engineering*, 1(1), 18-22.
DOI: 10.26855/aae.2025.07.005

Received: May 23, 2025

Accepted: May 26, 2025

Published: July 24, 2025

***Corresponding author:** Moqi Li, Hunan Automotive Engineering Vocational College, Zhuzhou 412000, Hunan, China.

Abstract

The development of society, the maturation and innovation of science and technology have driven the development of my country's aero-engine manufacturing industry, the level of aero-engine manufacturing technology has been significantly improved, and the demand for related talents has greatly increased. At present, the establishment of training objectives for aero-engine manufacturing technology professionals and international talents in my country's higher vocational colleges and the development of professional curriculum systems are still in the exploratory stage. In order to effectively implement the training of aero-engine manufacturing technology professionals in higher vocational colleges, this paper focuses on the research on the construction measures of the professional curriculum system of aero-engine manufacturing technology in higher vocational colleges under the employment orientation, and strives to build a curriculum system for this major through a comprehensive analysis. Provide a valid reference.

Keywords

Employment orientation; Higher vocational colleges; Aero-engine manufacturing technology; Curriculum construction; Measures

1. Introduction

With the prosperity of my country's economy and the rapid development of all walks of life, the demand for professional talents has increased. In order to provide more high-quality and professional talents for the development of society in line with the current situation, the Ministry of Education has added many new majors to its professional catalog, and aviation engine manufacturing technology is one of the many new majors. The aviation engine manufacturing technology major was proposed by the Ministry of Education in 2016. Since then, various higher vocational colleges have begun to explore the construction of professional curriculum systems and practical teaching. During the construction of the curriculum system, higher vocational colleges take industry orientation as the starting point and explore effective measures for talent training and classroom system construction.

2. Overview of the Background and Characteristics of the Aviation Engine Manufacturing Technology Industry

The important power unit inside the aircraft is the aviation engine equipment, which is called the top priority in equipment manufacturing operations. The manufacturing level of aviation engine equipment is not only a reflection of my country's industrial level, but also a reflection of my country's scientific and technological development level

and comprehensive strength. As a representative technology-intensive product, aviation engines work under high temperature conditions, high speed and high load and other harsh and complex environments, which increases the requirements for the design, processing and manufacturing capabilities of aviation engines, which are specifically reflected in the following different aspects:

2.1 Strict requirements for product materials, and processing is difficult

The internal rotating parts of aviation engines can operate under different temperatures and loads and different environmental media. Based on this, most of the materials used have good strength, and have good heat resistance and corrosion resistance. Nowadays, most of the various parts and materials used in aviation engine manufacturing are mainly titanium alloys, high-temperature alloys and composite materials. These materials are difficult to process, and the parts have complex curved surfaces and complex structures. This affects material processing to a certain extent and increases the difficulty of material processing and production.

2.2 Strict requirements for product performance, reliability and precision

Most aircraft engines are used for a long time and repeatedly under alternating loads, high speeds, high pressure, high temperatures and high altitudes. Therefore, there are strict requirements for the application performance and reliability of the products, and even stricter and higher requirements for the precision of the entire manufacturing process of internal parts of aircraft engines. The manufacturing processes and production modes commonly used by people in the past are difficult to meet the current requirements for high precision, high quality and high reliability in the manufacturing of aircraft engine equipment. Therefore, with the continuous development of science and technology, more new technologies will be applied to automobile engine manufacturing operations. At present and in the next few years, various new technologies such as intelligent manufacturing, additive manufacturing and digital processing will be widely used in the manufacturing of aircraft engines, and will continue to innovate and develop on this basis.

3. Analysis of the Talent Demand

3.1 The talent demand in the international market

At present, countries around the world have increased their investment in manpower and funds to develop a new generation of high-performance aviation engines. Driven by the wave of globalization, aviation engine manufacturing technology has become more mature and has achieved better development, driving the development of the entire aviation engine manufacturing industry, and creating favorable conditions for international cooperation in aviation engine manufacturing and talent training in my country. Because the manufacturing of aviation engine mechanical equipment is difficult, it not only involves a lot of basic scientific knowledge, but also includes new applied scientific knowledge, involving many fields and their key technologies, among which the most well-known ones are: precision and ultra-precision production and processing technology, CNC processing technology and composite material production and manufacturing technology.

Therefore, the manufacturing of aviation engines has strict requirements on talents, funds, science and technology and other aspects. The research and development and manufacturing of aviation engines is a relatively large project, which is difficult to be completed efficiently by a single enterprise. Take the UK as an example. A British company called Rolls & Royce took the form of independent research and development to study the new generation of aviation engines, but eventually went bankrupt due to the high cost of research. Considering the above risks, many countries around the world have adopted the model of international cooperation to carry out and implement this arduous task during the research and development and manufacturing of aircraft engines and the construction and training of talents.

In view of the current situation, my country's domestic aviation manufacturing enterprises have gradually participated in the international division of labor under the leadership of the country and developed military and civil aviation engines with independent intellectual property rights. With the accumulation of experience, some Chinese companies have gradually surpassed Western aircraft engine production and manufacturing companies. However, from the current situation of talents, this means that my country urgently needs talents with a sense of the overall situation, understanding of my country's national conditions and the current situation of the industry, patriotism, and high professional level and innovation ability. As the main battlefield for talent training in my country, higher vocational colleges shoulder the heavy responsibility of training talents and should increase the training of such talents.

3.2 The talent demand in my country

In the 13th Five-Year Plan, my country clearly defined the importance of aviation engines and gas turbines, and listed them as the first of the top 100 projects in my country. The National Development and Reform Commission also proposed to include the aviation industry (including aviation engines, civil aircraft, and aviation materials, etc.) in my country's strategic emerging industries, and at the same time, to make the aviation industry the focus of current and future development. "Made in China 2025" will organize the innovation of large aircraft, aviation engines and gas turbines, as well as civil aerospace and high-end CNC machine tools, and regard the above contents as the focus of development, towards specialization and industrialization [1]. In addition, in the future, my country will also increase its technological research, vigorously develop advanced turboprop engine and high bypass ratio turbofan engine technology, and establish an industrial system with Chinese characteristics and independently developed engines. Taking into account the current situation and the future trend of my country's engine industry, my country will increase its demand for aviation engine talents [2]. After reading relevant literature, I learned that most of the current professional talents in the aviation engine industry come from ordinary equipment manufacturing majors. Many companies have invested a lot of money to cultivate the professional skills and professional qualities of graduates from vocational colleges with ordinary mechanical manufacturing majors, improve the comprehensive ability and professional level of talents, and make up for the gaps in various positions in the company [3].

The current industry's demand for talents' technical skills is mainly reflected in the following different aspects: First, it needs talents with solid mechanical machine tool theory and can skillfully perform CNC processing, laser processing and precision machinery casting, and operators of various precision processing equipment such as 3D printing; second, it needs high-quality talents who can skillfully operate various equipment such as articulated arms and three-coordinate machines and have the ability to detect parts; third, it needs talents who have mastered the basic knowledge and skills of the overall structure and assembly of aviation engines, mastered the troubleshooting and detection capabilities of aviation engine mechanical equipment, and can do a good job in the quality control of the assembly process, and can be competent for the production and maintenance of aviation engine parts and after-sales positions.

4. Measures for the Construction of the Curriculum System in Higher Vocational Colleges Based on Employment Orientation

4.1 Construction of professional curriculum system

During the construction of the professional curriculum system, it should be constructed based on employment needs and the cultivation of job capabilities, and divided into three different stages: the first stage is the stage of cultivating basic job capabilities, the second stage is the stage of cultivating core job capabilities, and the third stage is the stage of cultivating comprehensive job capabilities. By cultivating students in accordance with different stages and combining different levels of capabilities, students can gradually and better master the professional skills of aviation engine manufacturing technology and cultivate students' comprehensive job literacy and capabilities.

Taking the core courses as an example, courses on the principles and structure of aviation engines, processing and CNC processing and simulation of typical parts of aviation engines, courses on disassembly and assembly of aviation engines, and courses on assembly and test technology of aviation engines can be set up. After the construction of the core curriculum system is completed, the professional core courses can be combined to systematically construct the professional curriculum system of aviation engine manufacturing technology [4].

4.2 Construction of practical course system

Higher vocational colleges are responsible for the training of technical and skilled professional talents. The construction of their professional practical teaching system is the key to fulfilling the task of educating talents. It can also reflect the comprehensive level of professional education and talent training of higher vocational colleges to a certain extent. Closely focusing on the employment trend of the aviation engine manufacturing technology market and the comprehensive ability requirements of the required talents for the positions, and in accordance with the cognitive laws of professional ability, a curriculum system with the cultivation of professional core ability as the focus and main line is constructed. First, basic courses are constructed, then professional courses are constructed, and finally comprehensive courses are constructed, ultimately forming a hierarchical spiral and hierarchical professional course practical teaching mechanism. In the practical course system, the training of basic skills, special skills and comprehensive skills is the focus. In the process of special skills training, the training of students' various

manufacturing technical abilities is strengthened, such as the ability to read drawings of mechanical drawing and the practical operation ability of general machinery processing machine tools, as well as the ability to heat treat materials [5].

5. Suggestions on the construction of the curriculum system based on employment orientation

5.1 Analyze the employment situation and build a curriculum system

During the construction of the curriculum system of aviation engine manufacturing technology major, it is necessary to give priority to analyzing the employment situation and understanding the industry's demand for talents. Later, in the process of professional curriculum system construction, the cultivation of professional ability should be taken as the goal, the curriculum system tasks should be taken as the driving force, the learning situation should be taken as the carrier, and the professional knowledge should be taken as the final foothold to build a professional curriculum system that combines work and study well and is based on competence.

The requirements for aircraft engine design and manufacturing are very demanding. Not only are there very strict requirements on the precision, reliability and performance of the products, but also on the requirements on product materials and processing quality. Taking these into account, during the construction of the curriculum system of aviation engine manufacturing technology major, higher vocational colleges should also understand the industry situation and characteristics, build a curriculum system, and ensure that the constructed curriculum system can cultivate high-standard talents that meet the needs of the industry [6].

5.2 International talent cultivation standards and curriculum construction suggestions

During the international training of aviation engine manufacturing technology professionals, the following key points should be mastered:

(1) Formulate a standard and curriculum system for the training of international aviation engine manufacturing professionals. The professional teaching standard is an important basis for the construction of the curriculum system and the reform of teaching content, which plays a driving role in improving the training level of international professional talents.

(2) In combination with the current situation of international professional talent training and internationally accepted standard technologies, we should strengthen the training of talents and develop their comprehensive abilities through measures such as strengthening foreign exchanges, cross-cultural communication, and overseas survival. This will not only cultivate high-quality talents with strong abilities and high professional levels, but also cultivate a group of high-quality talents with international vision and contemporary awareness, and cultivate high-quality talents who are proficient in foreign languages and understand international rules and management.

(3) During the construction of international courses, add international aviation engine manufacturing skills and literacy content to the curriculum and teaching content, and reasonably integrate international advanced technological achievements and industrial standards into my country's curriculum system. The reformed courses of "Mechanical Drawing" and "English for Aviation Engines" and training courses on parts processing and production technology are offered to form the core curriculum system of aviation engine manufacturing technology.

6. Conclusion

In the new era, the types of aviation engine manufacturing technology are more abundant, and the technology is also constantly innovating and developing, which puts higher requirements on higher vocational colleges. On the one hand, higher vocational colleges need to keep up with the development of the industry, innovate and optimize the talent training model, reposition the goal of talent training, build a new curriculum system, and create a high-quality education environment. On the other hand, in order to improve employment and enable the trained aviation engine manufacturing technology professionals to find better employment, higher vocational colleges should build a curriculum system based on employment orientation, combine theoretical knowledge teaching with practical teaching, and cultivate professional talents with high comprehensive level. Finally, in order to adapt to the international development trend and improve the internationalization level and international influence of my country's aviation manufacturing industry, my country also needs to study international talent training courses, do a good job in the standard formulation and curriculum construction of international talent training, and cultivate high-quality talents with manufacturing literacy and professional skills, so as to better adapt to the international development status of aviation engine manufacturing technology and better serve the high-quality talents of my country's aviation

engine manufacturing industry.

References

- [1] Chen Y. Research on the innovation and entrepreneurship education methods for vocational college students based on employment orientation. *Intelligence*. 2021;(1):155-7.
- [2] Wu BQ. Research on the integration of production and education in the balance of aircraft engine rotors. *Ind Innov Res*. 2020;(20):165-6.
- [3] Wei HW, Yuan J. Survey and analysis of aviation maintenance technical talents in vocational colleges. *Equip Manag Maint*. 2020;(9):41-3.
- [4] Zhou LM. Research on hybrid teaching of engine courses based on practical projects. *Exp Technol Manag*. 2020;37(4):234-7.
- [5] Yan Y. A preliminary study on the internationalization of the aviation engine manufacturing technology major in vocational colleges: taking Changsha Aviation Vocational and Technical College as an example. *Sci Technol Vis*. 2020;(4):127-30.
- [6] Tian ZK, Liu W, Huang W. Research on the teaching reform of the course "Helicopter Engine Structure and Fault Analysis" under the background of informatization. *J Sci Educ (First Half Mon)*. 2019;(10):89-90.