

Adaptability Study of Higher Vocational Education Enabling the Transformation and Upgrading of Manufacturing Industry --Equipment Manufacturing Industry in Guangdong Province as an Example

Yingzi Xu *

Qingyuan Polytechnic, Qingyuan, Guangdong 511510, China

Abstract. Guangdong is the first economic province in China, and by the end of 2022, the GDP of Guangdong Province has ranked first in the country for 34 consecutive years. Since the "14th Five-Year Plan", Guangdong Province has vigorously developed the manufacturing industry, insisted on the manufacturing industry as the leader, focused on the development of advanced manufacturing industry and high-tech manufacturing industry, promoted the development of the industrial structure to a higher level, and initially formed a "one nucleus, one belt, one area" manufacturing industry synergistic development pattern, in the In terms of scale strength, innovation level and foreign trade cooperation, Guangdong manufacturing is in the national leading level. In the new stage of development, Guangdong manufacturing is in urgent need of transformation and upgrading to reshape its competitive advantages. Vocational education shoulders the important mission of serving regional economic development, and the development of vocational education can provide strong talent support for the transformation and upgrading of the manufacturing industry. Through the integration of industry and education, it is conducive to promoting the technological research and development and product innovation of enterprises, and enhancing the competitiveness of enterprises in the international market, so as to empower the transformation and upgrading of the manufacturing industry in Guangdong Province.

1 Introduction

Guangdong Province has always been a national leader in the manufacturing sector, and realizing the high-quality development of China's manufacturing industry will give Guangdong Province an even more important responsibility. In the "14th Five-Year Plan" period, in order to promote the high-quality development of manufacturing industry, Guangdong Province adheres to the core of manufacturing industry, focuses on the development of advanced manufacturing industry and high-tech manufacturing industry, in order to adapt to the development trend of high-end, intelligent and green development trend, promotes the transformation of manufacturing industry to Guangdong ZhiZhuang industry, and accelerates the realization of the historic leap from a large province of manufacturing industry to a strong manufacturing industry province [1]. Vocational education plays a crucial role in serving regional economic development. By the end of 2021, there were 89 independent higher vocational colleges and universities in Guangdong, with a full-time higher vocational enrollment of 1.178 million students, an increase of 284,000, or 31.8%, compared with 894,000

students in 2020, and the scale of higher vocational education has maintained a rapid growth trend. Along with the rapid development of the economy, higher vocational education in Guangdong Province is also constantly reforming and innovating to serve the development of the regional economy and industrial transformation and upgrading. 2020, Guangdong Province has set up a total of 19 high-level professional groups and 185 provincial-level high-level professional groups, and the percentage of professional points for the major category of equipment manufacturing has reached 10.6% among all the 3,210 professional points, which has provided high-quality development of the manufacturing industry in Guangdong Province with Strong talent support [2].

2 Guangdong Province equipment manufacturing industry development status analysis

The equipment manufacturing industry refers to the manufacturing field that manufactures various kinds of mechanical equipment, industrial equipment, electronic equipment, transportation equipment, military equipment and other kinds of equipment as its main products.

* Corresponding author: 510178427@qq.com

According to the 2020 Guangdong Provincial National Economic and Social Development Statistics Bulletin, the added value of advanced manufacturing industry in Guangdong Province accounted for 56.1% of the added value of industry above scale, of which the added value of equipment manufacturing industry accounted for 46.0% of the added value of industry above scale, accounting for 13.5% of the total value of GDP in that year [3]. It can be seen that the equipment manufacturing industry is an important engine for the development of the whole Guangdong industry. According to the data shown in Table 1, among the top 10 industries in GDP, five industries corresponding to the major categories of specialties are equipment manufacturing categories. The first of them is the computer, communication and other electronic equipment manufacturing industry, with a total output value of 858.390 billion yuan in 2020; the second is the electrical machinery and equipment manufacturing industry, with a total output value of 349.457 billion yuan in 2020; and the third is the automobile manufacturing industry, with a total output value of 186.466 billion yuan in 2020. Corresponding to the five industries in the equipment manufacturing category, in addition to the computer, communications and other electronic equipment manufacturing industry to maintain a stable output value, the output value of the remaining four industries have increased by more than 5%, of which the electrical machinery and equipment manufacturing industry increased by more than 8%. It can be seen that the industry corresponding to the major

category of equipment manufacturing specialties accounted for a high proportion of the total economy, and has a good growth trend, should become a key area of training of higher vocational personnel.

In the above-scale industry, the increase of equipment manufacturing industry is obviously larger than the traditional high energy consumption industry, and the development advantage is obvious. Among the top 10 industries, 4 industries belong to high energy-consuming industries, and the corresponding major categories of specialties are mainly the major categories of energy power and materials. According to the data in the Statistical Bulletin, the gross output value of high-energy-consuming industries accounted for 25.1% of the value added of industries above the scale, while the value added of high-tech manufacturing industries in Guangdong Province accounted for 31.1% of the value added of industries above the scale. From the growth point of view, high energy-consuming industries, non-metallic mineral products industry growth of 2.5%, electric power, heat production and supply industry decreased by 0.4%, chemical raw materials and chemical products manufacturing industry increased by 0.1%, rubber and plastic products industry increased by 0.9%, the growth rate is significantly lower than the equipment manufacturing industry. It can be seen that the industrial structure of Guangdong Province is developing in the direction of intensification, low-carbonization and intelligence.

Table 1. Major professional categories corresponding to the top 10 industries with total industrial output value above scale in Guangdong Province in 2019-2020

Business	Gross output in 2019 ((CNY) 100 million)	Gross output in 2020 ((CNY) 100 million)	2019-2020 Growth rate(%)	Amplitude Corresponding specialized categories
Computer, communication and other electronic equipment manufacturing	8670.24	8583.90	-0.1	Equipment manufacturing
Electrical machinery and equipment manufacturing	3385.01	3494.57	8	Equipment manufacturing
Automobile manufacturing industry	1837.00	1864.66	6.6	Equipment manufacturing
Electricity, heat production and supply industry	1714.09	1678.14	-0.4	Energy Power and Materials
Non-metallic mineral products industry	1413.99	1470.76	2.5	Energy Power and Materials
Fabricated metal products industry	1383.22	1411.89	4.8	Energy Power and Materials
Rubber and plastic products industry	1266.48	1287.54	0.9	Energy Power and Materials
Specialized equipment manufacturing industry	1115.39	1255.83	4.8	Equipment manufacturing
Chemical raw materials and chemical products manufacturing	1103.09	1191.46	0.1	Biological and chemical industry
General equipment manufacturing	973.98	1014.13	5	Equipment manufacturing

Data source: Based on the 2021 Guangdong Statistical Yearbook and the 2021 edition of the Catalogue of Higher Vocational Specialties.

3 Matchability Analysis of Distribution of Higher Vocational Professions and Structure of Equipment Manufacturing Industry in Guangdong Province

Technical Vocational Education and Training (TVET), is the master key in this education sector in this twenty-first century. Due to global competition, a nation's

competitive advantages lies much in the high quality and competence of its manpower which is a result of quality education more so TVET [4]. According to the data in Table 2, in 2020, there will be 43 primary industry-related professional clothings in higher vocational colleges and universities in Guangdong Province, the number of secondary industry-related professional clothings will be 1451, and the number of tertiary industry-related professional clothings will be 1835. The

proportion of secondary industry major distribution points is 43.6%, which is slightly higher than the proportion of industry (39.2%) and the proportion of employed personnel (35.9%). The equipment manufacturing industry is usually regarded as the foundation of other industries and is vital to the stability and development of the whole economy. According to the data shown in Table 3, in 2020, the number of higher vocational equipment manufacturing major distribution in Guangdong Province is 344, accounting for 10.6% of the total number of major distribution, and the proportion of the size of the student population is 9.82%. And from the proportion of employed personnel, the proportion of employed personnel in the manufacturing industry of Guangdong Province in 2020 is 28.3%, combined with the proportion of value added of the equipment manufacturing industry in Guangdong Province in 2020 (accounting for 13.5% of the total

value of the current year's GDP), the analysis shows that, although the proportion of the secondary industry's professional distribution is slightly higher than the proportion of its industry and the proportion of employed personnel, the scale of distribution of the equipment manufacturing majors attributed to the secondary industry is still Far from enough, there is a large gap, and the number of distribution points for more than 10 majors such as intelligent Internet-connected automobile technology, industrial Internet application, intelligent robotics technology, intelligent optoelectronic manufacturing technology and other majors oriented to future technological development is extremely limited, and it is necessary to appropriately expand, increase the number of distribution points for the major category of equipment manufacturing and continue to increase the scale of enrollment in this major category of majors.

Table 2. Distribution of specialties in higher vocational education in Guangdong Province and the structure of industry and employment

Industry Category	Number of professional	locations Percentage (%)	Percentage of enrollment size (%))	Industry share (%))	Employee share (%)
Primary Industry	43	1.29	0.86	4.3	10.9
Secondary Industry	1451	43.6	22.76	39.2	35.9
Tertiary Industry	1835	55.1	76.21	56.5	53.2

Data source: Based on data from the Guangdong Provincial Statistical Yearbook 2021 and the Annual Report on the Quality of Higher Vocational Education in Guangdong Province (2021)

Table 3. Distribution of major categories of higher vocational equipment manufacturing in Guangdong Province

Specialties under the Equipment Manufacturing Category	Specialty II							Total
	A	B	C	D	E	F	G	
Industrial Robot Technology							45	45
Mechatronics Technology							43	43
Electrical Automation Technology							40	40
New Energy Vehicle Technology						32		32
Mold Design and Manufacturing					26			26
Numerical Control Technology					23			23
Intelligent Control Technology							19	19
Industrial Design					18			18
Automobile Manufacturing and Testing Technology						17		17
Mechanical Manufacturing and Automation					17			17
Mechanical Design and Manufacturing					13			13
Drone Application Technology			8					8
Automotive Electronics Technology						6		6
Intelligent Networked Vehicle Technology						5		5
Elevator Engineering Technology				5				5
Refrigeration and Air Conditioning Technology				4				4
Intelligent Manufacturing Equipment Technology				3				3
Digital Design and Manufacturing Technology (New)					3			3
Electromechanical Equipment Technology				3				3

Industrial Internet Application							3	3
Intelligent Robot Technology							2	2
Intelligent Optoelectronic Manufacturing Technology					2			2
Intelligent Electromechanical Technology							1	1
Additive Manufacturing Technology					1			1
Yacht Design and Manufacturing	1							1
Physical and chemical testing and quality inspection technology					1			1
Railway transportation engineering machinery manufacturing and maintenance		1						1
Ship Power Engineering Technology	1							1
Ship Electrical Engineering Technology	1							1
Total	3	1	8	15	104	60	153	344

Data source: Organized according to the website data of various higher vocational colleges and universities in Guangdong Province. The category of ships and marine engineering equipment is denoted by A; Railway equipment is denoted by B; Aviation equipment is denoted by C; Electromechanical equipment is denoted by D; Mechanical Design and Manufacturing is denoted by E; Automobile Manufacturing is denoted by F; Automation is denoted by G.

4 Conclusion

Equipment manufacturing plays a crucial role in industrial production and modern social development, and is a complex, diversified and highly technical industry. In the "14th Five-Year Plan for High-Quality Development of Manufacturing Industry in Guangdong Province", the equipment manufacturing industry is an important part of the strategic pillar industries and emerging industries in Guangdong Province in the future, and is also a key engine for promoting the overall development of Guangdong Province's economy [5]. Technology development required students, particularly in the vocational field, to have creativity, critical thinking, and entrepreneurship [6]. In the new stage of development, higher vocational colleges and universities in Guangdong Province take the initiative to adapt to the needs of regional economic and social development, in 2020, higher vocational colleges and universities in Guangdong Province, according to the actual situation of regional industrial development, stop enrollment of 336 professional points, new 372 professional points, the new professional points in 9.56% of the new professional points docked in the Guangdong Province equipment manufacturing industry.

However, from the overall situation of Guangdong Province higher vocational colleges and universities in the equipment manufacturing category of professional distribution point of view, for the equipment manufacturing category of professional distribution of the scale is still far from enough, and professional distribution of the phenomenon of imbalance is more serious. From the professional category, the professional distribution is concentrated in automation, mechanical design and manufacturing, automobile manufacturing and other three categories, and other categories are rarely involved. From the point of view of the subordinate

specialties, the distribution of specialties is mainly concentrated in the traditional specialties such as industrial robotics technology, mechatronics technology, electrical automation technology, etc., while the number of the distribution of more than 10 specialties facing the future technological development such as intelligent Internet-connected automobile technology, industrial Internet application, intelligent robotics technology, intelligent photovoltaic manufacturing technology and so on is extremely limited, for example, in the "High-quality Development of Manufacturing Industry in Guangdong Province", "14th Five-Year". In the "14th Five-Year Plan" of Guangdong Province, intelligent networked automobile is a key area of development [7], and at present, there are only five professional sites in this area in Guangdong Province's higher vocational colleges and universities, which need to be expanded and strengthened. At the same time of adjusting the professional distribution points, higher vocational colleges and universities should strengthen the "synchronous resonance" with the industry and carry out in-depth integration of industry and education. Higher vocational colleges and universities should take the initiative to adapt to the situation of regional industrial changes and development, combine the "14th Five-Year Plan for High-Quality Development of Manufacturing Industry in Guangdong Province" with the construction of majors, build majors on industries, and take industrial colleges and vocational education alliances as the carriers, to carry out the exploration of school-enterprise collaborative education modes such as modern apprenticeship and order training, so as to realize the precise education of people. The program will be combined with the construction of specialties in the industry.

Fund Project

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