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Research on German Technician Certificate Education - A Case Study of Mechatronics Major

Jiujun Zhen[1,*], Zhanmin Yang[2] and Xiaoyong Wang[1]

[1]School of Mechanical Engineering, Nanjing Institute of Industry Technology, Nanjing, Jiangsu 210023, China

[2]School of Electrical Engineering, Nanjing Institute of Industry Technology, Nanjing, Jiangsu 210023, China

*Corresponding author

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Abstract. Starting from the research status of German technician certificate education, the German vocational education system, the German technician certificate education and the corresponding position of higher vocational education in China was analysed. Furthermore, the syllabus and teaching requirements of mechatronics technicians in Bavaria, Germany was studied in detail. By comparing the higher vocational education in China with the education of technicians in Bavaria, Germany, combined with the experience that can be used for reference, the enlightenment of German technician education on higher vocational education in China is expounded.

Introduction

In recent years, the study of modern apprenticeship education in China has been more in-depth and has been practiced in various ways. The certificates introduced by domestic vocational education are mainly AHK certificates, which are aimed at the level of first-line technical workers, while the certificate system for high-end skilled workers (technicians) is almost blank.

German technician training is a continuing education for the profession. It is sponsored by German state governments and industry associations and is hosted by a technician school. It is mainly for technicians who have received vocational education and have more than one year of work experience. The technician is different from the first-line technical worker, and his duty is to complete the technical work handed over by the engineer, which is equivalent to the quasi-white collar. The design of this system has greatly promoted the enthusiasm of enterprise technical workers to participate in vocational continuing education.

Under the situation that the number of students in higher vocational colleges is reduced and the enrollment of individual schools is difficult, the introduction of the German technician certificate education concept and the introduction of the technician certificate can improve the teaching quality of higher vocational colleges in China and improve the international education level of higher vocational colleges. Furthermore, it can promote the enrollment and employment of schools. At the same time, it also provides a bright road for the development of higher vocational students.

Research Status of German Technician Education

At present, some researches on the German technician education have been carried out in China, and the research on the education model of German technicians has formed some mature results. The main research topics are as follows:

The paper written by Wan Jie, published in the Journal of Beijing Labor and Social Security Vocational College, “Viewing China's Vocational Education Reform from German Experience”, analyzed the German vocational education reform and the successful implementation of the Bavarian teaching plan in the Elcot Education Group. The dual system and the technical education of technicians were expounded, and the enlightenment and reference were finally drawn.

The paper " Revelation of German technician education to Chinese higher vocational education " written by He Fugui and Zhang Mei analyzed the German vocational education system, the German technician education and the corresponding position of higher vocational education in China. Then it analyzed the technician teaching plan of Bavaria, Germany and the training method of the technicians of the Eckert Education Group. Comparing the higher vocational education in China with the technician education in Bavaria, Germany, combined with the experience that can be used for reference, it expounds the enlightenment of German technician education on China's higher vocational education.

The paper "German Technician Training Curriculum Model and Enlightenment" written by Gong Jianguo and Zhang Yurong, starting with the curriculum model developed by German technicians, analyzed the "traditional subject curriculum + project teaching" curriculum model, the "traditional subject curriculum + action task" curriculum model, the curriculum model in the field of study. Finally, it put forward the enlightenment to China's higher vocational education.

Zhang Liqun's "Classroom Teaching Practice of German Technician Schools" mainly introduced the enrollment and training of German Technician Schools, and made a deep discussion on the development of training equipment and the management of training rooms. While learning from the German dual system, it reflects on the problems of Vocational Education in China.

Wang Minglun's essay "Comparison of German and Chinese Technician Courses" mainly introduced the characteristics of German technician education, including: practical courses, comprehensive courses, professional courses, general course positioning, application of new technologies, social and management ability training, etc.

Through the analysis of the above related research, it is not difficult to see that the domestic research on the dual system education and technician education of German vocational education about education methods, training objectives, teaching models, professional settings, experimental teaching, etc. were relatively mature. For the specific mechatronics professional technician education research and certificate introduction has not been fully developed. Therefore, this research is of great significance to the introduction of higher-level education certificates in higher vocational colleges in China, the construction and curriculum reform of mechatronics technology specialty in higher vocational colleges, and the promotion of the connotation and level of personnel training of mechatronics technology specialty in higher vocational colleges.

Introduction to German Vocational Education

Vocational education in Germany is mainly composed of dual vocational education and technician education. The corresponding relationship with vocational education in China is shown in Figure 1.

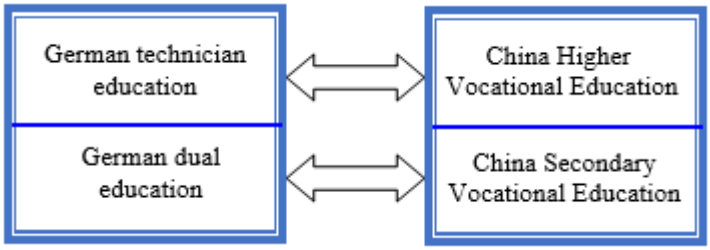


Figure 1. Correspondence diagram

Implementation of Dual Vocational Education

Dual education is done by training companies and vocational schools. It is the first training that a young person receives before entering a professional career after completing compulsory education. Specifically, the entire training process is carried out in the corporate and national vocational schools (Berufsbildenden Schule, BBS), and this education model is based on corporate training. The practice in the enterprise is closely combined with the theoretical teaching in vocational schools.

Implementation of Technician Education

Technician education is mainly for skilled workers who have received vocational education and have more than one year of work experience. It is a continuing education for the profession. This education is hosted by German state governments and industry associations and is undertaked by a technician school.

Vocational education has a special status in Germany, and vocational education and general higher education are open. Normal high school students can also attend vocational schools. The following are various educational exchanges and career developments:

Normal high school→Abitur→ Vocational School (2 years IHK)→University;

Normal high school → University (not finished) → Vocational school (2 years IHK) → corporate work;

Vocational school (→ technician school) → university → vocational school teacher or company white-collar workers;

Vocational school → technician school → company white collar;

Vocational school → blue collar (technical workers).

When a company recruits undergraduate level talents, it will give priority to undergraduates with a professional background. The teachers in vocational schools are mainly Master's degree students graduated from the university, and then they are trained in vocational schools for 2 years and then for 1 year in vocational schools.

Introduction of the German Technician Certificate

Technician Certificate Features

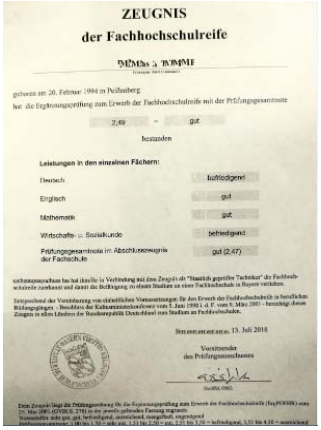
To understand the level of education of technicians, it is necessary to understand the classification of German education. German education is divided into 8 levels, the sixth level is equivalent to the undergraduate level, the seventh level is equivalent to the master's degree level, and the eighth level is equivalent to the doctor degree level. Technician education is at the level 6 level.

In Germany, technician training lasts for two years and is the responsibility of the education departments of the states. The students eventually participate in the unified examination of technicians in the state and obtain a nationally recognized technician certificate. Technicians will also leave the production line to work in the office, and their duties are to complete the technical work assigned by the engineer.

This kind of system design has greatly promoted the enthusiasm of enterprise skilled workers to participate in vocational continuing education, and provided a bright road for personal development.

Technician Certificate Content

Students will receive two diplomas after graduation from the technician school. One is a general diploma, and the non-professional course must be qualified. It can be used for further studies. There is also a certificate that all courses must be qualified and this nationally certified technician certificate is ued for employment. The certificate is shown in Figure 2 and Figure 3.


ZEUGNIS
der Fachhochschulreife

geboren am 20. Februar 1994 in Peißenberg
hat die Ergänzungsprüfung zum Erwerb der Fachhochschulreife mit der Prüfungsgesamtnote

2,49 – gut

bestanden

Leistungen in den einzelnen Fächern:

Deutsch	befriedigend
Englisch	gut
Mathematik	gut
Wirtschafts- u. Sozialkunde	befriedigend
Prüfungsgesamtnote im Abschlusszeugnis der Fachschule	gut (2,47)

München, den 13. Juli 2016

Vorsitzender
des Prüfungsausschusses

Figure 2. The general diploma

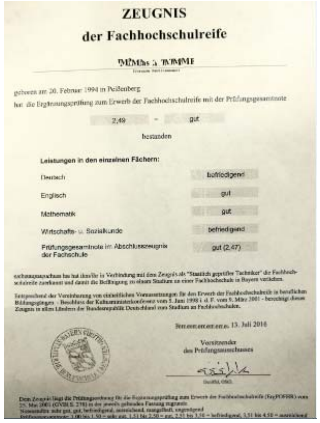

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Figure 3. Technician certificate

Figure 2 shows the certificate for further study. The upper part is the name of the certificate holder, the middle part is the grade point and the basic course grade, and the lower part is the grade description and the school principal's signature.

The upper part of Figure 3 emphasizes a nationally certified, authoritative certificate. The middle part is the compulsory course grade and the specified subject grade. The lower part is the grade description and the school seal and the principal's signature.

Students of technician school study at school full-time; Students of vocational school study alternately in enterprises and schools. Study time of vocational education students is 1:1 or 2:1 in enterprises and school time, but need to communicate with the company.

Research on the Syllabus and Teaching Requirements of Mechatronics Technicians

The Task of Technician Education

The Technician School serves deeper vocational or transfer training. The education work of the technician school is determined by the following relevant laws: the Federal German Basic Law, the State Education and Teaching Management Law, and especially the educational norms stipulated by the state constitution for various types of school.

The purpose of technician education (training) is to train professional and technical personnel with professional experience who can undertake the tasks of middle management functions. The syllabus is based on the knowledge and ability of students who already have vocational primary education (ordinary technical education) and have professional work experience.

The education (training) of the technician school mainly imparts professional knowledge and methodological knowledge, enabling students to be professionally competent in the complex requirements of the professional environment. After obtaining the qualification of the technician, students who have taken some courses will be admitted to the University of Applied Technology.

Teaching Plan of Technician Education

The theory and practice of technician education are equally emphasized, and the educational system lasts for two years. Generally, the courses can be divided into three categories: general courses, professional compulsory courses and professional elective courses. The proportion of curriculum structure of Bavaria technicians certificate education (mechatronics) in Germany is as follows: during the two years, there were 2960 hours, of which 320 hours for general courses accounted for 11%, 1920 hours for professional compulsory courses accounted for 65%, and 720 hours for professional elective courses accounted for 24%.

The first year of the course includes: General Course (German, English, Mathematics, Economics and Social Sciences), Professional Compulsory Courses (physics, chemistry and materials, electrical and electronics, information technology, engineering mechanics, control technology, software engineering, electromechanical systems).

The second year of the course includes: Professional Compulsory Courses (corporate psychology, business economic management processes, software engineering, electromechanical systems, electromechanical systems development, design, robotics), Professional elective courses (measurement technology, adjustment technology, motor and drag , Power Electronics, Bus and Network Technology, Microcontroller Technology, CAD/CAE, Production and Manufacturing Technology, Mechanical Parts, New Materials Technology, Environment and Management, Project Management, Electromechanical Related Mathematical Methods, Professional English).

Course Description:

(1) Students select elective courses within a given range at the latest before the end of the first year. The given range is selected by the school in the elective course catalogue provided by the Ministry of Culture and Education.

(2) There may be several graduation examination courses, and 4 must be selected.

(3) The total number of hours per week for the four selected graduation examination courses is at least 10.

Comparison with China's Higher Vocational Education

The research on the certificate system of German technicians (mechatronics major) is of great significance for exploring the development of higher vocational education in China, especially for the construction of mechatronics technology and curriculum reform. It is of great significance to improve the connotation and level of talents training in higher vocational mechatronics technology majors.

Table 1 is a comparison between technical education in Bavaria, Germany and higher vocational education in China.

Table 1. Comparison of two kinds of Education

Comparative term	German Bavarian Technician Certificate Education	China Higher Vocational Education
Category of Education	Vocational continuing education(2years)	Higher Vocational Education(3years)
Entrance students	Dualistic education, experience in corporate practice	No corporate practice
Purpose of learning	Clear purpose, upgraded by skilled workers to technicians	Find a good job, or a college degree to a bachelor's degree
Teaching plan	Establishment of State Education and Culture Department	Each higher vocational college develops its own according to the national professional standards
develop skills	Professional ability, team ability, creativity, organizational ability, responsibility awareness	Professional ability, social ability, method ability
teaching method	Ability-oriented teaching method	Project Teaching Method
Last semester	Students complete enterprise projects in teams under the guidance of Teachers	On-the-job internship and graduation design
Teacher source	More then 2 years of training in a vocational school, and 1 year of vocational school apprenticeship	Directly from school to classroom

Summary

Through a detailed study of German technician education, it can be seen that in order to improve the quality of higher vocational education in China, it is necessary to strengthen the training of the practical ability of teachers of higher vocational colleges and improve the level of teachers in higher vocational colleges. Research ability-oriented teaching method to improve teachers' education and teaching level. Strengthen school-enterprise cooperation and improve student employment. We should constantly draw useful experience from the development of German Vocational Continuing Education and provide reference methods for our higher vocational education in order to improve the level of our higher vocational education.

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