



Research on the Mode, Characteristics and Development Trend of Dual System in University of Applied Sciences-Taking Zhejiang University of Science and Technology in China as an Example

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Abstract

The research on talent training mode of Applied Science Universities has been deeply analyzed under the background of new technology industry. Taking Zhejiang University of Science and Technology as an example, from the perspective of global value chain, we aim at modern industrial policies and achieve new talent training goal. From a theoretical point of view, the training model of applied talents in local universities in China is explored by using the education model of German University of Applied Sciences for reference. The characteristics and enlightenment of the training mode of applied talents in German's Applied Science Universities are analyzed. From a practical point of view, with reference to the mature experimental teaching system in Universities of Applied Sciences and the talent training model in Universities of Applied Sciences, the commonness, differences and influencing factors of reform are explored. From the subjective conditions of research, Zhejiang University of Science and Technology is a typical "Applied Science University" with a good talent training model. Based on the existing training mode, the integration of production and education and cultivation of applied talents under the background of dual system are expounded.

Keywords: University of Applied Sciences, Dual System, Cultivation of applied talents, Integration of Industry-University-Research

INTRODUCTION

The origin and present situation of applied science universities

The University of Applied Sciences first came into being in Europe in the mid-1960s. It is an important part of the modern higher education system. For example, Germany established the University of Applied Sciences in 1968. Germany has greatly changed the situation of application-oriented education and research-oriented education and their isolation from each other (HY Xu, 2018). Finland's University of Applied Science and Technology was founded in the 1990s. Finland's University of Applied Science and Technology and ordinary universities have formed a dual

pattern of harmonious symbiosis. Finland's University of Applied Science and Technology has clearly set the goal of talent training in the development process, paying attention to the level of students' knowledge transformation and technological innovation (SL Shen, 2021).

In the early stage of development, the specialty setting of University of Applied Sciences was narrow and single, mainly focusing on the three traditional fields of engineering, economy and social undertakings. Nowadays, there are not only majors in engineering, economy, social education, art and agriculture, but also applied majors in natural science, information technology, law, management, language, culture, health care, nursing and other fields. A large number of interdisciplinary composite majors

have emerged, such as economic engineering, economic mathematics and bioengineering.

After entering the 21st century, due to the promotion of European education policies such as Bologna Process and Copenhagen Process, Germany has launched a series of policies aimed at promoting the integration of applied education and general education, as well as the integration of applied education and academic education (HS Li et al., 2015).

Between 2000 and 2019, the number of freshmen in German's Universities of Applied Sciences more than doubled (from about 98,000 freshmen in 2000 to about 220,000 freshmen in 2019). In 2019, 43% of German freshmen started their studies in Universities of Applied Sciences (31% in 2000) (H Lackner, 2020). The number changes of German's universities of applied sciences and German's universities (BJ Zhang et al., 2017) as shown in (Figure 1).

The rise of Applied Science Universities in Germany is the result of the interaction of society, politics and economy. In the process of its rise, it gradually formed its own characteristics and advantages. Its successful experience has important enlightenment for the development of Applied Science Universities in China.

From the formation and development of the German University of Applied Sciences and the training mode of applied talents, we can see that The University of Applied Sciences has many unique features in the training of applied senior professionals. It has won the welcome and recognition of German economic circles and the public. There are many lessons for China's higher education reform, especially the classification and orientation of universities.

Professor MY Pan, a higher educationist, defined the application-oriented undergraduate colleges according to the International Standard Classification of Education: Focusing on local undergraduate colleges and universities,

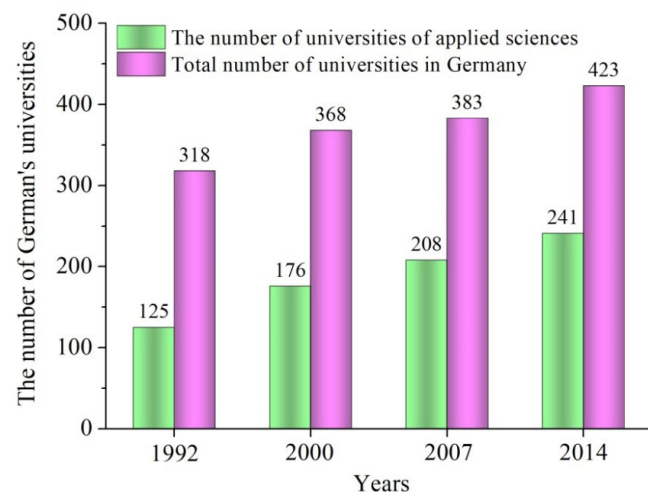


Figure 1. The number changes of German's universities of applied sciences and German's universities.

with high-tech expertise from all walks of life as the core, training applied professionals (MY Pan et al., 2010).

According to the data of official website, the Ministry of Education of China, as of June 30th, 2020, there were 1,270 undergraduate colleges and 716 application-oriented undergraduate colleges in China, accounting for 56.38% of the 1,270 ordinary undergraduate colleges and universities in China. However, like the orientation of applied science universities in Germany, the goals of many applied universities in China are basically between research universities and higher vocational colleges.

In order to be different from research universities, the training goal does not emphasize academic research ability, but emphasizes practical application ability. In fact, this expression is relatively broad. It cannot well explain the characteristics of talent training in application-oriented universities from the perspective of ability (LQ Xu et al., 2008) (ZQ Xing et al., 2005). Researcher LQ Xu (LQ Xu, 2005) also put forward the view that higher education in China should change from "research-oriented" to "application-oriented".

Therefore, for China, it is necessary to focus on the new technology industry and students' career development, increase the cultivation of applied talents, improve the linkage mechanism of higher education and promote the construction of applied science universities, focusing on the needs of national technological development. We should adjust the thinking of specialty setting to cultivate high-quality applied talents for our country.

DISCUSSION

Research on Talent Training Mode of Applied Science University

At the beginning of the 21st century, higher education in China has entered the stage of popularization, and the demand for talents has diversified. How to classify and develop colleges and universities to meet the diverse talent needs of society is an urgent problem in the development of higher education in China.

According to the types of talents and training objectives, the fifth-level education of higher education is divided into three types: research-oriented, applied and practical. Application-oriented universities focus on cultivating undergraduates and professional postgraduates, and their scientific research focuses on applied theory research and development research (LQ Xu, 2008). Specialty setting is industry-oriented, mainly for local training of applied senior professionals from all walks of life. The trained talents have a wide professional caliber and a wide range of applications. It not only masters certain theoretical knowledge, but also has strong application ability (LQ Xu, 2008).

German higher education attaches great importance to the cultivation of talents in natural science and engineering

technology. It has also developed a university form-applied science university, which works closely with enterprises (ZY Xu et al., 2011). In addition, the German University of Applied Sciences attaches importance to the combination of theory and practice. Keep long-term cooperation with enterprises, and form a situation of conscience interaction in which the government, schools, enterprises, teachers and students participate together. Under this talent training mode, teachers can accelerate the iteration of scientific and technological research and development, achievement transformation and new technology update through cooperation with enterprise projects. Besides, students learn new technologies and skills in class and practice class (B Xu, 2016). According to different talent training programs, students can complete a vocational training and obtain relevant vocational qualifications in addition to obtaining undergraduate degrees. The University of Applied Sciences pays more attention to the cultivation of students' practical ability and innovative ability.

The faculty of the University of Applied Sciences has rich practical experience, professional qualification certificate and scientific research and development ability, so it can combine theory with practice in teaching and ensure the high-quality teaching level of teaching students in accordance with their aptitude. For example, most professors of the University of Technology Berlin in Germany are from enterprises and have engineer qualifications (LQ Xu et al., 2007).

Researcher LQ Xu (YY Tian, 2018) expounds the characteristics of applied undergraduate talents around the teaching reform of applied undergraduate colleges, and puts forward the training mode and operating conditions of applied undergraduate talents. It provides an effective way to cultivate high-quality applied talents and meet the growing talent demand of enterprises and society.

Different from the traditional general undergraduate training, the training of applied talents not only emphasizes subject logic and subject knowledge. Starting from practice, we should build a discipline system with distinctive professional characteristics, fully consider the needs of national development and enterprise posts, flexibly set up practical courses and majors, and build the concept of "from practice to practice".

At present, China's social development is facing the pressure of industrial upgrading and the rapid growth of emerging productive forces. The specifications and types of market demand for talents are changing, and it is urgent to train a large number of applied talents through applied science universities. This background is very similar to Germany's vigorous development of applied science universities. The experience and practice of German University of Applied Sciences in cultivating applied talents are of great significance for the reform of talent training mode in local universities in China.

Reform of Talent Training Mode-Taking Zhejiang University of Science and Technology as an Example

Since the establishment of the China-Universities of Applied Sciences Alliance, Zhejiang University of Science and Technology, as the vice-chairman of the Alliance, has actively joined other transformation pilot institutions. Zhejiang University of Science and Technology has promoted the transformation of application-oriented university and implemented the reform of talent training mode. The predecessor of Zhejiang University of Science and Technology was founded by Zhejiang University in 1980 (LQ Xu et al., 2015). After more than 40 years of construction, the school has developed into a distinctive application-oriented provincial undergraduate university with the right to confer Master's and Bachelor's degrees and to recruit foreign students and students from Hong Kong, Macao and Taiwan. For a long time, the school has been committed to building a new modern application-oriented university with German model and China characteristics. It is a pilot institution for Sino-German cooperation in training higher application-oriented talents, and the Ministry of Education has implemented the "Excellent Engineer Education Training Plan", the "National College Students' Innovation and Entrepreneurship Training Plan" and the "National 13th Five-Year Education Modernization Promotion Project-Production-Education Integration Development Project" to build universities.

Zhejiang University of Science and Technology has been cooperating with Germany for nearly 40 years, and it is one of the earliest applied universities in China aided by Germany. German Chancellor Angela Merkel met with representatives of our school during the G20 Hangzhou Summit and highly praised the achievements of Sino-German cooperation in our school. In 2009, Zhejiang University of Science and Technology established the German Institute of Education and Culture, a school-level research institution. In 2014, the Ministry of Education of China approved the establishment of Sino-German Institute of Engineers. In 2015, the Sino-German School-Enterprise Cooperation Alliance was established.

After defining the orientation of "application-oriented, local-oriented and open", the school has made bold explorations and attempts on the training mode of high-quality connotative talent, and made unremitting explorations on the concept of talent training for a long time. In terms of personnel training mode (LQ Xu et al., 2015)

SPECIALTY SETTING

Taking the industry as the goal

Facing the increasing demand of "new format, new industry and new technology", schools need applied technical talents. In September, 2021, Zhejiang University of Science and Technology cooperated with Bosch Automotive Service

Technology (Suzhou) Co., Ltd., and was approved as the "Dual System" undergraduate major of Sino-German school-enterprise cooperative vehicle engineering. In addition, the school also cooperates with Lubeck University of Applied Science and Technology, West Coast University of Applied Science and Technology, and Zwickau University of Applied Science and Technology in West Saxony to develop superior disciplines such as civil engineering, electrical engineering and its automation (management direction) and industrial engineering (intelligent manufacturing direction), so that the school can cultivate high-quality applied talents satisfied by industries and enterprises.

TEACHERS' CONSTRUCTION

Promoting the cultivation of "double-qualified and dual-capable" teachers

Zhejiang University of Science and Technology has introduced "dual-qualified and dual-capable" talents. Teachers in the school have both professional knowledge and experience as enterprise engineers. Through the method of theory and practice, students' general knowledge and special knowledge are organically combined.

CURRICULUM CONSTRUCTION

Building a modular curriculum system

Through the setting of modular courses, students are provided with flexible and open choices. For example, the School of Mechanical and Automotive Engineering puts forward an order-based training mode to improve students' practical ability.

Because talent training is a complicated process, it is more necessary for schools to cooperate with enterprises in the form of "integration of production and education" with the help of industry resources to cultivate high-quality applied talents (LQ Xu et al., 2015).

Therefore, the talent training mode of applied science universities needs to strengthen the relationship between enterprises, industries and society in combination with their own advantageous disciplines, practical teaching and scientific research industrialization. Through the reform of talent training mode in applied science universities, we can cultivate high-quality applied talents and fully stimulate the endogenous motivation of society, industry and enterprises.

CONCLUSION

With the advent of the "internet plus" and the era of intelligent manufacturing, the traditional technology model and the global industrial pattern have undergone profound changes due to the impact of new science and technology and new industrial forms (Y Sun, 2020). The rapid development of manufacturing and new technologies in various countries cannot be separated from the support of a large number of compound skilled personnel. From the perspective

of personnel training, the key to realize technological innovation depends not only on academic and scientific research talents, but also on the experience accumulation and practical exploration of a large number of first-line applied technical talents (C Cai, 2022) (HX Wang et al., 2021). Facing the problems of backward industrial structure and weak competitiveness of traditional technology, the United States put forward the "manufacturing revival plan" in an effort to develop the Internet-high-tech industry (JJ Liu et al., 2020). The EU put forward the "enhanced industrial revolution". Germany even put forward "National Industrial Strategy 2030", aiming at supporting key industrial fields and further improving Germany's innovation ability, so as to maintain Germany's leading position in the new round of world industrial competition (K Kou et al., 2019). In contrast, there are still many bottlenecks in China's new technology industries, such as chip technology, mask aligner technology and new energy industry (ZX He et al., 2020) (Pan H et al., 2021). The reason is the lack of high-end applied talents.

On the one hand, the existing talent training mode can no longer adapt to the rapid development of international technological upgrading and industrial integration. On the other hand, in the face of the accelerating popularization of higher education in China, local undergraduate colleges, as a part of it, have become the main force of talent training and education in China. However, due to the unclear training objectives of some local undergraduate colleges, the training mechanism of applied talents needs to be improved. Moreover, the applied skilled talents are in short supply. Therefore, it is of great significance for the country to propose a new talent training model for applied science universities based on the demand of new technology industries for talent training.

DISCLOSURE STATEMENT

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