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Research and Practice on the Training Mode of Application-Oriented and Innovative Talents

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***Abstract*-With the expansion of the scale of higher education, higher education has changed from elitism to popularization. Cultivating applied talents is not only the trend of education development in China, but also the requirement of social and economic development. How to cultivate applied talents is the most important thing in the development of colleges and universities. Based on the comparative analysis of the types of talents, this paper establishes a scientific, rational and distinctive training system for applied talents. The application of HRT Formula Racing Team of Harbin Institute of Technology (Weihai) has been realized. The students have deeply combined the theoretical knowledge with the design and manufacture of racing cars. A large number of innovative achievements have been applied to racing cars, which fully proves the effectiveness and feasibility of the applied talent training system.**

Keywords-applied talents, higher education, talent training mode, practical teaching

I. INTRODUCTION

It is clearly that to meet the needs of national and regional economic and social development, we should establish a dynamic adjustment mechanism and constantly optimize the structure of higher education. Optimize the structure of disciplines, types and levels, and promote interdisciplinary integration [1]. Emphasis should be placed on expanding the training scale of applied, compound and skilled talents. It is a strategic plan put forward at the national level under the background of fierce competition for talents, and it is also the first time that the training of applied talents has been put into the official document. The training of competitive applied talents system can combine the training of outstanding engineers with practical teaching, through the combination of production and learning, school-enterprise cooperation, make up for the lack of a single school education, and cultivate more competitive talents.

The world is in a period of great development, great change and great adjustment. With the deepening development of world multipolarization and economic globalization, rapid progress in science and technology, and increasingly fierce competition for talents, talent training should adapt to the development of the times. Colleges and universities should support students to participate in scientific research, strengthen practical teaching links, promote the combination of production, teaching and research, and accelerate the transformation of scientific and technological achievements. However, the current talent training system is partial to the mastery of basic theoretical knowledge and the improvement of curriculum system, ignoring the cultivation of applied ability. In order to better adapt to the development of the times, colleges and universities should integrate practice into the curriculum content based on their own teaching characteristics and train all-round applied talents. Training applied talents is not only based on the requirements of the national macro level, but also the trend of educational development.

II. ANALYSIS AND COMPARISON OF DIFFERENT TYPES OF TALENTS

A. *Applied Talents*

Applied talents are a special type of talents who apply professional knowledge and skills to practice and engage in non-academic research work under the guidance of certain theoretical norms. Its specific connotation is constantly developing with the development of higher education history. Applied talents correspond to academic talents who are good at theoretical research and skilled talents who are good at practical operation. They not only have sufficient

theoretical basis and professional accomplishment, but also can integrate theory with practice and apply knowledge to practical talents. The main task of applied talents is to apply scientific principles directly to social practice and create direct economic benefits and material wealth for society. The core is to use, and the essence is to apply what you learn [2]. Social and economic development and progress have a large demand for applied talents. Applied talents will also play a major role in the social talent structure, promote social progress and provide rich social benefits.

B. Academic Talents

The main task of academic talents is to transform some real existing laws in the field of natural science and social sciences into theoretical knowledge or scientific principles, thus showing the relationship between various things [3]. Their knowledge composition is mainly some basic science, and their work function is mainly to find the relationship between various things, without obvious practical elements.

It is precisely because academic talents focus on discovering and researching objective laws in the fields of natural science, social science and humanities, and lay particular stress on theoretical knowledge learning, so the knowledge structure of academic talents is more dependent on disciplines, with systematic and theoretical characteristics, and their scientific research ability and innovation ability are more prominent.

The training task of applied talents mainly uses the combination of some theoretical knowledge and life practice to cultivate talents with strong social practicality. Their knowledge composition is also some applied sciences, and their work function is to apply the existing scientific theoretical knowledge to practice, so as to promote the continuous progress of social life and provide social benefits.

C. Skilled Talents

Skilled talents are the first-line posts in production and service fields. They master specialized knowledge, technology and ability around the specific application of posts, possess certain operational skills, and can use their own technology and ability to carry out practical operation in work practice. Emphasis is laid on the mastery of vocational skills, theoretical knowledge can be used adequately, without requiring systematic and complete knowledge structure.

Applied talents are between the two. Compared with academic talents, applied talents pay more attention to technical knowledge than scientific knowledge; pay more attention to technology application than theoretical research; pay more attention to the comprehensive application of multi-disciplinary knowledge than the vertical depth of knowledge in a certain discipline; pay more attention to theoretical guidance and practice than practical verification theory; pay more attention to further education than advanced education. Vocational demand is characterized by the organic unity of academic and skill-based. Compared with skilled talents, applied undergraduate talents emphasize solid theoretical education, systematization and integrity of technical system knowledge, ability of applied scientific research and potential of follow-up career development. The comparative analysis is shown in Table 1.

III. RESEARCH ON THE TRAINING SYSTEM OF APPLIED TALENTS

A. Innovative Education Concept and Popularization of the Concept of Applied Talents

To develop the training system of applied talents, first of all, we should let teachers and students understand the direction of education development, the talent structure of society and the current situation of enterprise talent demand. Only by laying a good ideological foundation can we better carry out training and education [4]. We should foster the awareness of applying the theoretical knowledge to practice and encourage students to actively participate in after-class practical learning activities. Colleges and universities should establish and improve the training mechanism of applied talents, popularize the concept of applied talents, so that students can not only learn but also use it, and provide students with a platform to improve their ability to apply theoretical knowledge. Nowadays, the society's demand for applied talents also provides more opportunities for students. Social demand for talents is multifaceted. If students' academic attainments are not so prominent, they can cultivate their practical ability, exert their strengths and avoid weaknesses, apply theoretical knowledge to practice, and promote future career development.

TABLE 1 ANALYSIS AND COMPARISON OF DIFFERENT TYPES OF TALENTS

Types	Academic Talents	Applied Talents	Skilled Talents
Content	transform real laws in the field of natural science and social science into theoretical knowledge or scientific principles	apply scientific principles directly to social practice, create direct economic benefits and material wealth for the society	focus on the specific application of posts in the fields of production and service
Knowledge structure	depends on discipline, has systematic and theoretical characteristics	has sufficient theoretical basis and professional accomplishment, and can integrate theory with practice to apply knowledge to practical talents	emphasis should be laid on the mastery of vocational skills and sufficient theoretical knowledge, without requiring the systematicness and completeness of the knowledge structure.
Highlighting ability	scientific research ability and innovation ability	combining theory with practice	operating skills

B. Establishing Teaching Practice Platform

Teaching practice platform needs to be based on the characteristics of colleges and universities. It can not only overcome the homogeneity of education, increase the diversity of education, but also highlight the characteristics of the university [5]. We should give full play to policy guidance, make full use of all resources, rationally orientate schools in accordance with their characteristics, develop teaching in advantageous areas, overcome the tendency of homogeneity and form unique school-running ideas and styles. Responding to the slogan of the state, we should have our own characteristics at different levels and in different fields and strive for the first-class. Establish a practical teaching platform, enhance students' ability to apply theoretical knowledge, encourage knowledge to feed back to society, improve the social service ability of teachers, students and universities, promote the combination of production, teaching and research, and accelerate the transformation of scientific and technological achievements.

C. Providing Guidance with an Experienced Team of Professional Teachers

Teachers are an important guarantee for the development of practical activities, the application of theoretical knowledge to practice, and the cultivation of students' practical ability. Excellent teachers can play a multiplier role in the training system. Teachers' education requires college teachers to have practical operation experience, work experience and relevant vocational skills in addition to their regular academic qualifications and qualifications, so as to provide better practical guidance to students. For the construction of teaching practice platform in school, we can consider introducing external experts to ensure the quality of applied talents training.

D. Constructing the Collaborative Training Mechanism between Schools and Enterprises

Collaborative training mechanism between schools and enterprises is a basic mechanism to improve the quality of college students' training. It is a talent training mode that integrates practical, applied and innovative abilities. The aim is to give full play to their respective advantages by complementing and integrating the advantages of universities and enterprises, and to cultivate high-quality talents that meet both the training standards of colleges and universities, as well as the needs of enterprises' career development, and meet the requirements of social industry development. School-enterprise cooperation highlights the cultivation of students' practical ability, application ability and innovation ability, and pays attention to the improvement of students' comprehensive quality, aiming at cultivating more high-tech and high-quality applied talents for enterprises [6]. In the spare time of students, through participating in school-enterprise collaborative projects, understanding the operation process of enterprises and experiencing how to apply the knowledge learned to practice are complementary to the applied talents training system in colleges and universities. Through the practice base co-built by schools and enterprises, students will be provided with more opportunities for practice and training, and at the same time, students' awareness of innovation and entrepreneurship will be stimulated, so as to effectively improve students' innovation and entrepreneurship ability.

E. Establishing and Improving an Effective Evaluation Mechanism

An effective evaluation mechanism can accomplish the training objectives smoothly and evaluate students' application ability in an all-round way [7]. The evaluation mechanism is a consideration of the training system. For example, a student's individual academic performance can be made up of many aspects, not just examination paper scores. The consideration of students' learning ability should focus on the process rather than the result, and be guided by the ability of applying theoretical knowledge to practice, rather than examination-oriented ability [8]. Effective evaluation mechanism can also analyze the existing data, timely adjust and improve the training system, and establish a more scientific and reasonable training mechanism.

IV. PRACTICE OF TRAINING APPLIED TALENTS BASED ON COMPETITION

A. Focus on Characteristic Specialty and Train Applied Talents

Harbin Institute of Technology (Weihai) emphasizes the combination of production, learning and application, cultivates all-round talents, and makes full use of their own advantages. The HIT Racing Team (HRT) for college students was established in 2009. Team members come from different majors and grades of the whole university, gathering all professional knowledge from the main vehicle design, modeling, processing, assembly and testing [9]. The internal structure of the fleet includes the body group, chassis group, electric group, power group and business group. Each team member applies his own professional knowledge or his beloved non-professional knowledge to practice and turns the knowledge in textbooks into products. HRT team not only highlights the professionalism, but also pays attention to interdisciplinary. Team members of different majors can apply their professional knowledge to the design and manufacture of the whole vehicle.

B. Building Excellent Teachers Team

The leading teacher of HRT racing team not only has excellent theoretical research results, but also has rich work experience in enterprise projects, who can provide strong guidance for students and grasp the general direction of the development strategy of teaching practice platform. Led by a team of excellent teachers, the HRT team successfully designed and built 15 Formula racecars, 4 Baja cars and 2 self-driving cars based on the combination of production and learning, as shown in Fig. 1. The potential of students is infinite. However, students' abilities cannot be fully developed only through theoretical knowledge education in the classroom. While Formula Student China (FSC) has

given students the ability to upgrade their engineering practice. The HRT team participated in the first FSC in 2010, as one of the earliest teams to participate in the race, under the guidance of excellent teachers. Team members dare to carry out technical innovation, the HRT team took part in the second year of the race using the first domestic carbon fiber single shell body, the technology at that time only Formula One racing car and foreign top college students Formula one racing team used; In 2014, HRT independently designed and manufactured the only innovative carbon fiber all-in-one shell body in China, drawing closer to the international leading level. As a pioneer in the field of domestic carbon fiber racing applications, HRT now has carbon fiber suspension, carbon fiber semi-axle, carbon fiber impact energy absorption block, full set of carbon fiber aerodynamics kit and other technologies, and uses pneumatic gear shift and other domestic technology.

Figure 1 Racing cars designed by HRT

C. Cooperative Training Mechanism of School and Enterprise

The HRT team has established a friendly and stable cooperative relationship with the sponsors in the past years. The major enterprises not only provide financial and material assistance to the construction of HRT, but detailed technical guidance. Sponsors provide funds each season to support the development of HRT and the manufacture of racing cars. In addition, the team also provides machinery, equipment and technical guidance. Every year, team members enter the major cooperative enterprises to practice, understand the practical application of the knowledge learned in the enterprise, and improve the practical ability of operation.

D. Establishing Perfect Rules and Regulations

In order to make the teaching practice platform run efficiently and guarantee the participating students to gain knowledge and skills, there are well-established rules and regulations within the HRT. Students need to check in every week. The individuals and groups with the longest check-in time will be rewarded, and those who fail to meet the basic requirements will be punished. The qualification of the registered team members is determined by the performance of the team members, so as to encourage the team members to fully participate in the construction of the teaching platform. And the good introspection summary system, is the team unceasing progress foundation. Every season, the team members need to summarize and reflection, in order to provide historical information.

So far, the HRT team has participated in China's national level and even Germany and Japan's world top competition, and achieved outstanding results. During the seven-year period, a total of 62 domestic and foreign awards, such as racing design, high-speed obstacle avoidance, ANSYS design and lightweight design, were awarded, and it was also the most awarded team in China. In 2016, HRT Electric Racing Team and HRT Baja won the national championship, and the HRT team became the first "double champion" in the history of the FSC, which fully showed the HRT team member's innovation, theory and practice level.

V. CONCLUSIONS

Based on the analysis of the current policy environment and the type of demand for talents in China, this paper studies how to train applied talents, and puts forward the concept of popularizing the cultivation of applied talents, which is based on the teaching characteristics of colleges and universities. This paper establishes a scientific, reasonable and characteristic training system for applied talents, and sets up a teaching practice platform with excellent teachers' team. The HRT team is not only an innovation platform for students, but also a teaching practice platform for cultivating students' comprehensive application ability. It has been applied in the HRT of Harbin Institute of Technology (Weihai). Through the practice in the team, students can combine the theoretical knowledge learned in class with the design and manufacture of racing cars, which stimulates students' innovation ability. A large number of innovation achievements have been applied to the racing car, which fully proves the effectiveness and feasibility of the application-oriented talent training system.

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