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Research on Innovative Applied Talents Training Mode of Local Universities Based on New Engineering

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***Abstract*—The study targets the current inconformity of teaching content and personnel training objectives with the needs of local economic development for local colleges and universities. With the initiation of the concept of "New Engineering", the local colleges and universities are required to cultivate talents with innovative application ability, establish the consciousness of serving the locality. Through the optimization of the teaching system we should strengthen the awareness of innovative personnel training, reform teaching methods and the personnel training mode, build a "production and research" platform for innovation and practice, and set up contest-oriented academic funds and innovation and entrepreneurship projects. The article also studies effective ways for the new mode of talent cultivation in local colleges and universities, and how to cultivate innovative application talents that meet local needs in the new era. By summarizing some effective methods and experiences obtained in the exploration of innovative practice, it provides some suggestions for your reference.**

Keywords—New Engineering; Local Universities; Innovation; Applied Talent; Mode

I. INTRODUCTION

At present, whether universities directly under the supervision of Ministry of Education or local colleges are faced with a more and more severe problem, especially for local colleges of science and technology. On one hand, it becomes difficult for college students to find a job. On the other hand, companies find it hard to find suitable personnel. This leads to a "dilemma" similar to a huge mountain lying in the employment of college students, blocking the connection between college students and businesses. Job hunting is very difficult for college students, with a certain number of students left unemployed right after graduation. Strangely enough though, for SMEs, there is no access to available personnel. In the past decade or so, other than the surge in graduates caused by college enrollment expansion, the most fundamental reason has been the mode of cultivating talents in universities not matching the developing needs in the new era of high-speed information, and that the cultivated talents have lagged behind. The three factors-generally low comprehensive quality, lack of innovative ability and weak hands-on application ability of graduates result in the lack of enterprise's confidence in colleges and universities. Thus it causes a vicious cycle with great social influence. Today, students in general lack the enthusiasm and initiative of learning, and even get too lazy to be engaged in their own majors. This is seemingly the case from the outside. However, the essential problem lies in personnel training mode.

In response to these problems in the current talent cultivation of universities, especially in the local universities and colleges, the Ministry of Education proposed the concept of "New Engineering" at Fudan University in Shanghai on February 18, 2017, namely the "Fudan Consensus". Engineers and technicians are confronted with even higher standards with National innovation-driven development, new technologies, new business formats, new models and new industries such as the "One Belt One Road", "Made in China 2025", and "Internet Plus" emerging as the symbols of new economic development. They also need to accelerate the reform and innovation of engineering education [1]. How can we cultivate innovative applied talents? How to reform and innovate teaching models so that talents can adapt to the needs of the new era? The local undergraduate colleges and universities are now facing the problem of reforming the old talent training mode, for instance, the "unity, universality and no-characteristics" model, the mismatch between theory and practice, and the need to establish project-oriented innovation. A new model for the cultivation of applied talents will focus on SMEs to cultivate the students' interests and abilities, serve local education systems, with innovation, application and local characteristics.

II. BUILD AN INNOVATIVE TEACHING SYSTEM BASED ON "APPLICATION + INNOVATION"

Undergraduate education at a local science university targets applied talents at a high level in the higher education system. They mainly learn through basic theory, basic knowledge and basic skills, in order to transform theories, scientific principles and knowledge into engineering design plans or drawings [2]. The task of engineering applied technology talents is to undertake product development, production management and business decision-making, with the overall quality and skills. In view of the fact that most local universities and colleges focus on theoretical training in talent

cultivation and overlook innovative thinking and application ability, the reform and innovation of the comprehensive teaching system are carried out.

Fully integrate theoretical courses, reduce theoretical hours, remove obsolete theoretical and technical knowledge, improve the applicability of theory, increase the practice of experiment, enhance innovative thinking and hands-on ability training, and build a unified local goal with logical theory teaching system, which consists of modules as shown in Fig. 1.

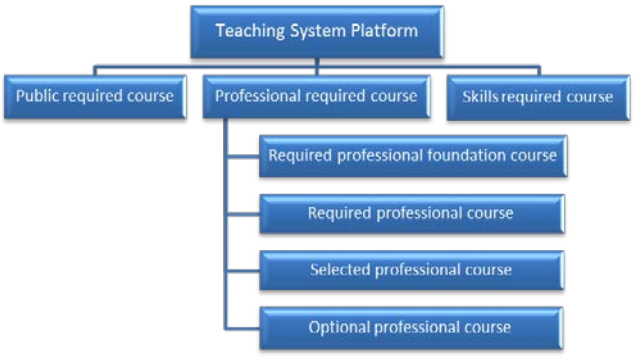

Fig. 1. Theoretical Teaching System Platform

Establish a platform for multi-level, diversified and innovative applied practice teaching system in line with local characteristics. At the end of each semester, the university should implement practical activities for students for 2 weeks of academic time. The content will include: study in the countryside or in the company, curriculum design (including basic courses and professional courses) and professional internships. In the fourth year of university, students are asked to take an internship and prepare graduation designs (thesis). Students go to local companies for internships. The school and local companies will sign agreements to protect the rights and interests of both students and businesses. Students can learn new things from companies including applied knowledge and updated information, management experience and subsidy for internships at the same time; companies can reserve future cadres and get help from students.

The cultivation of professional and non-professional compound talents is also a challenge that must be considered by local polytechnic colleges. It is necessary to expand the development of the talent cultivation system and to carry out elective courses from the school level. Students are required to get enough credits. The elective courses must include compulsory and optional ones, and at the same time carry out scientific training, such as holding scientific lectures and selecting topics for innovative projects. Business experts or other university experts are introduced to attend academic lectures in schools to broaden students' knowledge and enable students to better understand the development of new technologies. It also inspires the students to pursue and think about new theories and technologies.

III. Build a New Teaching Model with Application as the Center and Innovation as the Core

The innovation of education is concentrated on the innovation of talent cultivation, aiming to cultivate a group of innovative talents [3]. At present, most teaching modes in local colleges and universities are "single, universal, featureless, and non-innovative". This teaching mode is no longer suitable for the requirements of the new era for talent cultivation, and the talents it cultivated lack of innovative thinking and application capabilities. Phenomena like unemployed graduates, "uselessness of reading" and other negative statements arise. With the introduction of the national "New Engineering" mechanism, we must reform the old teaching mode, and build a new one with "application as the center and innovation as the core" to cultivate more talents with innovative thinking and application skills.

A. Highlight "application" and cultivate "analytical" capabilities

The teaching system of local universities and colleges is obsolete and single, and lacks local characteristics. Therefore, the out-of-date students, backward technology, and poor hands-on application ability are not welcomed by local enterprises and institutions and cannot serve the local industrial economy. In response to these problems, teaching management and teaching implementation must be fully innovated and reformed. Firstly, the school should allow teaching materials to be set by front-line teachers. At the same time, first-line teachers are encouraged to compile new technology materials. Secondly, teaching content and teaching calendars are taken care of by front-line teachers. Deletion and addition of knowledge are determined by group discussions to ensure the quality is not obsolete, and the knowledge and techniques taught are not backward. Thirdly, when class teachers teach knowledge, while emphasizing the basic theory, they must also highlight the application of new knowledge and new technologies. They should combine examples to explain with the help of multidimensional methods, and solve the practical problems students encounter in learning. Fourthly, we should cultivate students' application knowledge and techniques from multiple angles, develop students' ability of analyzing and solving problems, and equip them with "comprehensive analysis" capabilities.

In short, the innovative teaching mode is "consolidating the foundation, highlighting the application, and knowing analysis".

B. Expand "new knowledge and new technology" and strengthen the "innovative thinking" training model

With the development of new information technologies, in addition to the basic knowledge taught by local polytechnic colleges, we must also expand the frontier theory and technology instruction of "new knowledge and new technologies", mainly in the form of extracurricular lectures, and invite experts both inside and outside the school (or entrepreneurs), for these scholars are deeply involved in theoretical and technological research and have rich application experience. This can effectively broaden students' horizon and effectively update students' knowledge and technology, and

cultivate students' interest in learning new things. Students' ability of mastering new knowledge and new technologies will also be enhanced.

Innovative lectures require the breaking of the experts' unity of command, setting up interactions between students and experts, asking questions of students, and answering doubts by the experts. At the same time, when asking questions, the students must do enough homework before class and the questions raised must have a certain quality. The questions of "innovation" can expand students' knowledge, increase new technologies, cultivate new ideas, and meanwhile strengthen the cultivation of students' innovative abilities.

C. Improve professional and non-professional quality

Nowadays, talents are compound talents. Students are required to possess not only professional acquisition, but also non-professional knowledge. Non-professional qualities directly affect the cultivation of talents [4]. For example, communication ability, psychological quality, attitude, volitional quality, values, morality will lay a good foundation for a person's follow-up development. Teachers should pay attention to this aspect of the teaching and practice process, to combine the reality and flexibly disseminate the positive energy of society. They need to be good at finding out China's current achievements in the world, especially in high-tech applications. In the implementation of professional teaching plans, it is necessary to fully consider various factors, not only focusing on professional knowledge and ignoring non-professional factors, but also cultivating professional and non-professional comprehensive quality.

IV. Build A New Model of Practical Teaching Based on "Local Industry-Oriented, Collaborative Promotion of Production, Learning And Research"

Local applied undergraduate universities should base themselves on and serve the local industries, especially small and medium-sized enterprises and public institutions. Local schools must establish local characteristics and local industrial economy as the target of service, promote local industrial upgrading and replacement, and provide local SMEs and institutions with technical support and knowledge services. The goal of talent training is to provide applied talents with engineering innovation capabilities, with their characteristics in accordance with industry and applicability [5]. The school teaching practice must go out of school, open up teaching resources, strengthen contact with relevant local government departments, strive for their support and assistance, and maximize the sharing of social resources, such as industry associations to promote cooperation and build "production, learning and research" teaching practice platform. Each department of our school has established a corresponding industrial college to connect with related industries. To create a "production, learning and research" practice platform for students, each year schools will receive application for innovation and entrepreneurship projects. For example, there are 437 applications in the school in 2018, and 291 of them are selected, including 40 at the national level, 91 at the provincial level and 200 at the school level. Through the project, students' enthusiasm is guided for learning, students' autonomous learning ability is developed, and the previous single-practice education model is changed through the "production, learning and research" practice platform. It also adds experimental bases to schools, enables schools and enterprises to share experimental base resources, and reduces school funding and experimental equipment shortages. Additionally, it increases the use of laboratory equipment of enterprises and the value of equipment use, and saves the expenditure of state financial funds. According to the students' interest, we choose the project content; let the students carry out the project in related companies or institutions. At the same time, we let the experienced engineers guide the students to conduct the project practice, and cultivate the students through collaborative innovation practice in the school (business). By providing practical bases, as well as students' guidance from engineers with rich practical experience, it not only enhances students' practical experience, but also theoretically improves students' creative thinking skills, practical and applied ability, and effectively trains students' ability.

In the process of implementing the construction of a high-level science and engineering university in Guangdong Province, we have adopted a "3+1" teaching practice reform model for some science and engineering majors. It takes 3 years to lay a good foundation for professional development and to cultivate comprehensive quality, while the last year is for innovative teaching practice. It's a two-way selection between students and enterprises. Students can choose to go to the enterprises and institutions, learn project design and management experience with engineers, or they can study theory and technology in-depth in school, and review for postgraduate entrance exams. The teaching unit sets up a special agency to coordinate and organize student practice, formulate rules and regulations related to practice, assess methods, strengthen communication and coordination with practice bases, establish mutual benefit and mutual trust agreements, conduct regular inspections and assessments, and ensure that all aspects of the student's practice are carried out smoothly. All rights and interests of all parties will not suffer losses, while quality and effect are guaranteed. This will improve the efficiency of innovative talent training in schools, the quality of school education, as well as social credibility. The practice in these three years has proved that the effect is significant, with local enterprises and institutions approving the students. For example, in the 2017 Internet Engineering (Internet of Things) class, a high-tech enterprise in Nanhai employed 7 students without probation. The reason was that the 7 students had practiced an internship in this company for nearly a year. Their adaptability, practical work and strong programming received the recognition of employers. Last year the employment rate of this class with 36 students was 100%, most of them finding a suitable position for their own development in the practice unit. This is a win-win effect.

V. Build a New Model of Talent Cultivation with "Contest as the Orientation, Innovative Projects as the Goal"

Our university is one of the four high-level colleges of science and technology in Guangdong Province. Under the guidance of Gao Jian, we must make breakthroughs in the near

future. Schools must take effective measures and concrete actions to fully integrate teaching resources and break out of old patterns. We should create a new talent training model driven by the "contest project". Students participate in the "contest" project with a great learning atmosphere, where they study autonomously and cultivate independent innovation capabilities. In the meantime, students are allowed to participate in projects organized by teachers and enhance their theoretical level of project management and comprehensive execution capability.

Organizing students to participate in national competitions is a powerful tool for testing students' learning ability and innovation ability. It is also one of the effective methods for cultivating innovative applied talents. For example, the School of Electronic Information Engineering of our school selects students to participate in "Blue Bridge Cup", "National University Computer Design Competition", "National University Biological Network Design Competition", and "National Undergraduate Intelligent Internet Innovation Competition" every year with outstanding results. In 2017, 3 students won the first prize in the country, 11 with the second prize, and 18 with the third prize. Some of the students also participated in the National Mathematical Model Competition and scored good results. For example, in the 2016 network project Class 5, 2 won the second prize in the national digital model competition in 2017, and 1 with the third prize. It is impossible to list all of the numerous prizes here. Through the establishment of high-level science and engineering universities in the past few years, under the guidance of multi-level vertical and horizontal construction of a "competition as the orientation, innovative projects as the goal," a new model of personnel training has achieved gratifying results. A number of students have won national competitions and patented inventions several times. For instance, in 2017 a graduate directly entered a vocational college in Foshan as a teacher. At the moment when only a doctoral student could enter a college as a teacher, the student won his job with a number of national competition awards and national invention awards. This shows that this kind of innovative talent training model is worthy of promotion and popularization. Last year, a sophomore stood out in the innovation and entrepreneurial training project competition, and wrote his own innovations and published them in SCI journals. A local college undergraduate student who had not even graduated yet and achieved such results attracted peers and universities to visit our school to explore their teaching modes and methods.

Each year, the school will spend a certain amount of funds to award instructors and students who have achieved major achievements in the competition. The aims are 1) to encourage teachers and students to innovate teaching; 2) to encourage the winners; 3) to set an example; 4) to highlight teaching quality engineering. The effect is significant. It has achieved great results in the past three years and has received good reviews from the society. For example, the graduates' employment rate for the three years was above 97.5%, and the average monthly salary rose from 3,500 Yuan to 4,700 Yuan. In addition to the competition, students should also be encouraged to think more about innovation and entrepreneurship training. During project research, they must learn to summarize the results on a regular basis. For example, this year when I direct the dissertations, one of the students is usually interested in the big data analysis project. So I encourage him to learn more about data mining knowledge and application software. He wrote a graduation thesis "Analysis and application of job hunting on Lagou.com based on Python's data analysis" this year, and applied his theoretical knowledge accumulated in the daily practice to the project. In mid-May this year he went to a technology company in Guangzhou for an interview, and he passed it and was accepted. After the probationary period, the monthly salary would be more than 6,800 Yuan.

VI. Conclusion

Under the background of the New Engineering, the "single, unified, and featureless" talent training model of local colleges and universities no longer meets the demands of the current era. How can we reform the personnel training mode and explore innovative talent training models that are consistent with local characteristics? That's the focus of this article. The article combines some methods of establishing a high-level polytechnic university with our school's innovative talent cultivation in the past three years. Due to limited space, the author can only conduct the innovation and application of talent training mode in the case of the college and the class he teaches. The simple discussions, the ideas and methods proposed are for reference only, hoping to give some inspiration and help in the training of personnel in the field of education.

All in all, the purpose of teaching reform in local application-oriented colleges and universities is to improve the quality of teaching. The essence of the reform is to innovate and apply the talent cultivation mode. The innovative and applied talents are helpful, stable, and comprehensively literate who will provide technical and knowledgeable support for local economic development. Our school is located in the core area of the Pearl River Delta - Foshan City, and it continues to innovate the characteristics of education and personnel training model. With the integration of related disciplines to fully connect with Foshan industries, it revolves around China's strategic emerging industries and Foshan's pillar industries, and focuses on the development of intelligent manufacturing, new materials and new energies, electronic information, bioengineering and food engineering, energy conservation and environmental protection, and manufacturing service.

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