

The Construction Path of Off-Campus Practice Base Based on the Cultivation of College Students' Innovative Practice Ability

Qiang Liu¹, Guoyan Yu¹, Duan Mei^{2,*}

¹ *School of Mechanical and Power Engineering, Guangdong Ocean University, Zhanjiang, Guangdong 524088, China*

² *Faculty of Mathematics and Computer Science, Guangdong Ocean University, Zhanjiang, Guangdong 524088, China*

**Corresponding author. Email: meid@gdou.edu.cn*

ABSTRACT

In the view of some problems in the construction of off-campus practice bases, such as low enthusiasm of enterprises to establish off-campus practice bases, low degree of integration between production and learning, and unclear implementation plan of practical teaching, this paper takes the Guangdong Ocean University –Zhanjiang CNE Solenoid Valve Co., LTD as an example, and expounds the construction path of college students' off-campus practice base and the results achieved.

Keywords: *Innovative practice ability, off-campus practice base*

1. INTRODUCTION

Off-campus practice base for college students is one of the effective ways to cultivate talents with innovative, practical ability, and it is also an effective talent training method adopted by many colleges and universities at present[1-2]. How to construct college students' off-campus practice base, improve the level of practice teaching, cultivate, and improve the students' ability to practice and innovation? In recent years, many experts and scholars and education workers have done much beneficial research, exploration, and training. These research results and practical experience for the construction of college students have a particular guiding significance to the off-campus practice base. However, there are still many problems in the construction of off-campus practice bases for college students [3-5], such as:

(1) There is a lack of interest convergence between the school and the enterprise, and the enterprise is not very active in establishing an off-campus internship base;

(2) Lack of long-term cooperation mechanism between schools and enterprises, and a low degree of industry-university integration;

(3) The implementation plan of practice teaching cannot be detailed, and the quality of training teaching cannot be guaranteed.

To deal with these problems, we have trained students' practice and innovation ability as the center, oriented by students' employment, and strengthened the construction of college students' off-campus practice base. In the choice of enterprises, the combination of

production, education and research and practice mode and other aspects of active exploration and practice, achieved good results. Taking Guangdong Ocean University-CNE Solenoid Valve Co., LTD as an example, this paper expounds on the construction path of the off-campus practice base for college students and the construction achievements of the off-campus practice base.

2. THE CONSTRUCTION PATH OF COLLEGE STUDENTS' OFF-CAMPUS PRACTICE BASE

2.1. Find The Converging Points Of The Interests Of Both The Universities And The Enterprise

The College of Mechanical and Power Engineering of Guangdong Ocean University is one of the colleges with distinctive engineering characteristics. With more than 40 years of undergraduate education, it has cultivated many high-quality engineering and technical talents. The college has four teaching departments, two scientific research institutes, and two experimental practice teaching institutes. The School of Mechanical and Power Engineering has a team of teachers with rich teaching experience, strong engineering practice ability and high quality, a set of relatively mature teaching, curriculum system and its management rules and regulations, a high-level team

of teachers, and a complete configuration of various essential and professional laboratories. The college has one provincial characteristic key discipline -- mechanical manufacturing and automation, two provincial-level engineering centers, three provincial-level experimental teaching demonstration centers, four municipal key laboratories, and engineering centers, two university-level key disciplines. Focusing on the manufacturing technology development and employment demand of Guangdong-Hong Kong-Macao Greater Bay Area, the college is devoted to cultivating talents with good professional ethics, innovative spirit, entrepreneurial consciousness, and global vision. The college is committed to cultivating talents with solid knowledge of mechanical engineering technology, information technology, and industrial engineering, as well as theories and methods of modern management science and system science to meet the needs of the industry. The college is committed to cultivating interdisciplinary talents in engineering and management to apply their professional knowledge to scientific research and practical work such as planning, design, organization, improvement, optimization, evaluation, and innovation in manufacturing, Marine engineering, and service fields.

The College of Mechanical and Power Engineering gives full play to the existing disciplines, faculty, engineering technology center, laboratory, and other essential advantages, and takes engineering education certification as an opportunity to promote education and teaching reform further, and is committed to cultivating high-quality application-oriented undergraduate talents. The college has been continuously deepening the mode of "industry-university cooperation, school-enterprise cooperation" and vigorously building and developing several off-campus backbone practice bases to provide sufficient guarantee for practical teaching.

CNE solenoid valve Co., Ltd. is a high-tech enterprise integrating research, development, production, and sales of gas control and execution system. Its products include a gas proportional valve, pressure regulating valve, solenoid valve assembly, water flow sensor, water servo, etc. The products are mainly used in high-end household gas products and are the supporting manufacturers of many well-known domestic gas enterprises. The company has advanced production equipment and equipped with a variety of testing tables, testing instruments, on-line computer testing equipment, and other perfect means of testing. The company strictly follows the quality management system standards from product design input, production process, delivery inspection, and after-sales service. In 2019, the company was rated as Zhanjiang Engineering Technology Research and Development Center. With more than 20 patents of various types, the main products have passed the national gas testing center and the European CE certification. In recent years, the company has

successfully introduced ERP, APS, and other information systems as the operation support system, and expanded the production scale, with an annual output of 1.5 million sets of gas valves and 1 million sets of water valves, committed to providing customers with better products and services. Since its establishment, the company has adhered to scientific and technological innovation and system innovation, guided by market demand, researched and developed new products timely, and improved product quality and grade. Under the background of development strategy and planning of CNE Solenoid Valve Co., LTD., the demand for talents with reliable mechanical engineering technology, information technology, and industrial engineering expertise is continually expanding.

As mentioned above, CNE solenoid valve co., LTD for Guangdong Ocean University school of mechanical and power engineering of professional students to provide product development, quality management, industrial information system, the production line layout planning, and so on many cognitive, practical operation, the cultivation of student's professional ability, the formation of professional employment has played an important role in guiding the future. And the faculty of the school can also provide strong intellectual support for the enterprise. Both sides find the converging point of interest, which lays a foundation for constructing an off-campus practice base.

2.2. Enterprises, Universities, And Research Institutes Should Cooperate Comprehensively To Improve The Operating Efficiency Of Off-Campus Practice Bases

CNE solenoid valve Co., Ltd. has muscular capital strength and a high market share of products. In the rising period of the rapid development of the enterprise, it adheres to scientific and technological innovation. It seeks to further improve the competitiveness of the enterprise by continuously cooperating with universities to jointly develop new technologies, new methods, new equipment, and new products. The School of Mechanical and Power Engineering has substantial technical reserves in mechanical design, manufacturing and automation, optimization and improvement of the production process, energy utilization, and other professional fields. It has obvious advantages in the scientific research force. At the beginning of 2020, the enterprise and the School of Mechanical and Power Engineering reached a primary intention of the "CNE-GDOU industry-university Cooperative Research and Development Project". Project cooperation intention includes seven projects in three directions, namely, product research and development, intelligent

manufacturing, and enterprise informatization, including:

(1) Research and development of micro dual switch integrated proportional valve for gas water heater: two gas on/off valves, one of which has integrated proportional adjustment function;

(2) Research and development of the water flow sensor of memory alloy for a steady flow of gas water heater: Through memory alloy, the output flow can be stabilized according to the inlet temperature;

(3) Research and development of electric water heater electric heat exchanger: Electric water heater and quick-heating faucet are installed to heat water flow with electricity as heating energy rapidly;

(4) Research and development of proportional valve with air pressure sensor: integrated air pressure sensor, which can output digital/analog signals to output pressure;

(5) Research and development of automatic production equipment: mechanized, intelligent, and automated modification of traditional manual work to improve production efficiency and product quality;

(6) Research and development of lean production mode: Adjust the operation units and process routes related to existing products, to improve per capita output and reduce waste;

(7) Research and development of the cost/wage accounting and release management system: manage the cost composition and piecework wage calculation method, and apply it to daily product quick quotation and employee wage calculation.

Start with industry-university cooperation, the two sides officially signed the Agreement on The Off-campus Practice Teaching Base for College Students of Guangdong Ocean University -- CNE Solenoid Valve Co., Ltd. in June 2020. The two sides jointly worked out the cooperation plan and formulated the construction and management system of the practice teaching for the industry-University-Research base. To realize the long-term cooperation mechanism of benign interaction between schools and enterprises, achieve the three goals of cultivating talents in the market demand, enhancing students' practical ability, and exploring the education mode combining industry and education, the two sides reached a consensus to carry out industry-university-research project research jointly. The construction of an off-campus practice teaching base provides a perfect off-campus practical learning environment for our students.

2.3. Strengthen Management To Ensure The Implementation Quality Of Practical Teaching And Scientific Research Work

The base will implement a series of practical teaching and scientific research work in students' cognition practice, graduation practice, and project cooperation following the construction plan of the practical teaching base.

2.3.1. Theory-Practice

First-year students of various majors in the School of Mechanical and Power Engineering take advantage of the off-campus practice teaching base to practice their majors. Sophomore and junior students go to the off-campus practice base to participate in the industry-university cooperation project, and gradually cultivate students' comprehensive practical ability and innovative spirit, to enhance students' learning enthusiasm and interest in their majors.

2.3.2. Practice-Theory

Senior students can go to enterprises for graduation practice and graduation thesis writing. Connect the graduation thesis with the graduation practice, hire engineers with rich practical experience as the guidance teachers outside the school, and share students' graduation thesis and graduation design with the guidance teachers inside the school. It can enable students to complete graduation practice and graduation thesis at the same time get pre-job skills training, which is conducive to the unit to accept the employment of students.

2.3.3. Training talents for enterprises

Give priority to recommend outstanding graduates who participate in the research and development of enterprise projects.

2.3.4. Scientific research cooperation

By combining production, learning, and research, we complement each other's advantages and promote the reserve of scientific research force and technological update.

3. CONCLUSION

Since the construction of Guangdong Ocean University-CNE Solenoid Valve Co., LTD. 's off-campus practice base for college students, the operation mode, construction scale, construction achievements, and other aspects of the base have been affirmed and praised by teachers and students, forming a right demonstration role. The establishment of the off-campus practice base for college students is a requirement for cultivating innovative and entrepreneurial talents, which is conducive to the cultivation of students' creativity and practical ability so that students can master the basic knowledge and skills necessary for production and improve their competitiveness before going to work. In the cultivation and construction of innovative talents in

the future, we will continue to explore, boldly innovate and practice, widely broaden our ideas, make full use of social resources, and build a practice base for college students outside campus. The university strives to cultivate many not only extensive knowledge, the strong desire for innovation, but also a good sense of community, solid foundation, high comprehensive quality, adaptability, innovative spirit, and practical ability of professional talents for the country and society.

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REFERENCES

- [1] Y.Luo, L.W. Xie, Y.Lin, Research on the Path to Improve college students' Innovation Ability based on off-campus teaching Practice base, *China Management Informationization*, 23(13) (2020) 230-232.
- [2] Q.Y.Zhou, Research on the Construction Path of college Students' off-campus Practice Base under the concept of Cooperative Innovation, *Journal of Jiamusi Vocational Institute*, 2016 (09) (2016) 259.
- [3] Hong Zhou, Reflection and Reconstruction of the management system of college students' Off-campus Practice Base, *Education Modernization*, 6(99) (2019) 163-164.
- [4] Y.L.Luo,Z.J.Li,S.J.Yu, Problems and Countermeasures of college students' Off-campus Practice Base Assessment Mechanism, *Modern Vocational Education*,2019 (25) (2019) 64-65.
- [5] F.Y.Huang,Z.P.Yi,X.Z.Xu, Problems and Countermeasures in the Construction of External Practice Base for Application-oriented University Students - A Case study of Liaodong University, *The Theory and Practice of Innovation and Entrepreneurship*, 1(19) (2018) 126-128.