



Exploring the Reform Path of Practical Teaching in Industrial Engineering

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Abstract. Taking the Industrial Engineering major of Guangdong Technology College as an example, the paper combines the characteristics of industrial engineering education and the current teaching situation. In response to the problems of insufficient experimental equipment, experimental teachers, and practical teaching experience in the practical teaching process of the industrial engineering major of the campus, an optimization plan for the construction of practical teaching in this major is proposed. In the paper, the following solutions are proposed including adjusting the corresponding teaching plan, introducing advanced experimental equipment, improving the structure of the teaching staff and strengthening school enterprise cooperation thus to achieve integration of industry and education, and further improve the constructions of the experimental and practical teaching system for industrial engineering courses.

Keywords: Industrial Engineering, Practical Teaching, Teaching Plan, Integration of Industry and Education

1 Introduction

Industrial engineering is an interdisciplinary field that combines engineering and management with the core of reducing production costs, improving production quality and efficiency ^[1]. With the continuous growth of the manufacturing industry in China, the position and role of industrial engineering professionals in the manufacturing industry are increasingly prominent, and advanced manufacturing and intelligent manufacturing are constantly emerging, which requires industrial engineering talents to have a higher perspective and exquisite technology ^[2-4]. At the same time, industrial engineering students should also acquire more solid theoretical knowledge, enhance practice, and improve comprehensive quality ^[5-6].

2 The Current Situation of Practical Teaching in Industrial Engineering

In order to understand the current teaching situation of Industrial Engineering major, the author will analyze the current situation in conjunction with Guangdong Technology College (hereinafter referred to as "GDTC"). The teaching team of the Industrial Engineering major of GDTC has found out that traditional practical teaching methods for industrial engineering lack for pertinence, practicality, and innovation through years of teaching experience. There are mainly four problems of the current situation: firstly, there is a shortage of practical teaching faculties and professional practical teachers. Secondly, the practical teaching contents are unreasonable, which is mainly caused by the limitations in experimental and internship conditions. Thirdly, there is a lack of experimental software and hardware platform facilities. Lastly, there is a lack of practical teaching evaluation and assessment system.

Therefore, it is crucial to reform the practical teaching of industrial engineering and establish an integrated teaching system that meets the requirements of enterprises and has industrial characteristics. This will help to further improve the quality of practical teaching in industrial engineering and provide better services to enterprises with industrial engineering characteristics. In this process, the reforming the practical teaching of industrial engineering can have a strong driving effect.

3 Contents of practical teaching reform and construction

3.1 Practical Teaching Improvement Path

3.1.1 Perfect the constructions of practical teaching faculty

Industrial engineering is an interdisciplinary field that requires both mechanical and management knowledge. It requires versatile talents, which is a major highlight of industrial engineering. Therefore, the first task of practical reform in industrial engineering is to strengthen the teaching staff. The teaching of a single major has limitations, while industrial engineering is an interdisciplinary field. Therefore, it is crucial to build a teacher team with different disciplinary backgrounds, which is conducive to achieving mutual communication, knowledge sharing, and mutual learning between teachers. Firstly, hire enterprise engineers as part-time teachers to participate in practical teaching of industrial engineering, to solve various problems encountered by students in experiments and internships. Secondly, industrial engineering teachers on campus will be trained by enterprises to understand their talent demand patterns. At the same time, teachers will be sent to top domestic industrial engineering universities to visit and learn. To lay the foundation for cultivating applied professional technical talents who are familiar with engineering technology and understand enterprise management.

3.1.2 Strengthen cooperation between schools and enterprises to achieve integration of industry and education

At present, Industrial Engineering of the campus has signed students' production internship contracts with multiple enterprises, which promote the integration of production and teaching and cultivate students' manual control ability. In order to improve the quality of students' practice, the "double Mentorship" is implemented. Each student is assigned a school instructor except for the guidance of the team leader. The team leader visits the company once a week to have in-depth communication with students. In addition, corresponding symposiums will be held at different internship stages of the students to enhance the internship experience of the students, consolidate internship achievements, and enhance students' comprehensive practical abilities.

3.1.3 Promote theoretical learning through disciplinary competitions

Actively encourage students to participate in industrial engineering related competitions and activities, promote learning through competitions, and promote the learning of theoretical and practical knowledge in industrial engineering through competitions. Through lean practical application projects, lean improvement week projects, and lean training projects, not only can students improve their hands-on and innovative abilities, but also stimulate their learning enthusiasm and interest. At the same time, it can also guide students to enhance their collective sense of honor. Through practical application cases in enterprises, guide students to utilize internship or practical opportunities, extract IE and management works, and participate in the National IE Application Innovation Case Competition. Encourage students to participate in extracurricular academic and technological competitions such as innovation and entrepreneurship competitions, industrial engineering innovation competitions in the Guangdong Hong Kong Macao Greater Bay Area, mathematical modeling competitions, and other domestic related competitions [4-6]. Organizing professional teachers and corporate mentors on campus to provide training and guidance to participating students, guiding them to be good at discovering problems, thinking and effectively solving problems, continuously innovating and improving, can enhance students' hands-on and practical abilities. Winning a competition not only enhances the school's reputation but also increases students' internship and employment opportunities.

3.2 Plan and Practice of Industrial Engineering Laboratory Construction

With the gradual expansion of the enrollment scale of the Industrial Engineering major of the campus, it is necessary to establish a laboratory that integrates practice, training, internship, and course design to complete the basic experimental requirements such as course experiments and course design within the major. At present, an industrial engineering laboratory has been established, as shown in Figure 1. The industrial engineering laboratory can be used for industrial engineering professional production intern-

ships, course design, graduation internships and graduation designs, comprehensive application case innovation competitions and so forth. It can also be used separately for internship applications, teacher research, enterprise training, etc.



Fig. 1. Industrial Engineering Laboratory

The industrial engineering laboratory mainly includes lean production and lean management, as well as an industrial engineering intelligent application analysis platform. The production research object is aircraft model products, effectively integrating OT+IE+IT, and achieving standardization, lean, digitalization, networking, and automation applications. Mainly including 3D printing and forming output equipment, small electric die-cutting machines and supporting tools, electric heating ovens and supporting tools, micro drilling machines and supporting tools, small tunnel furnace UV electric heating assembly line, small screw feeder and screw gun, automatic locking screw equipment, aircraft product standard chemical level plate, industrial engineering practical experimental aircraft product kit, industrial engineering practical supporting tooling mold Industrial engineering practical supporting material box, industrial engineering practical supporting application tool, industrial engineering practical equipment fixture mobile box, industrial engineering practical training field student supporting operation platform, experimental expansion simulation analysis application case, lean practical training materials, practical application dedicated service device, cabinet, switch, lean practical teaching and display screen, lean practical display application props, software simulation application desk and stool, supporting coach chair A series of teaching equipment and instruments such as lean practical training audio systems are all assisted by standard working hours systems, product process analysis and design systems, experimental report production and management systems, industrial engineering education and training systems, method research systems, and lean practical performance evaluation form systems.

3.3 Improve the evaluation and assessment of practical teaching

Strengthening process assessment and diversified assessment is an important means to promote students' hands-on and innovative abilities in the practical process. It requires

every teacher to carefully assign tasks, adjust teaching methods and progress according to the actual teaching situation, and combine theory with practice, so that twice as much can be accomplished with half the effort. Practical ability assessment also plays an important feedback role in customizing practical course contents, stimulating students' interest, and meeting the ability requirements of different students. The process assessment should also emphasize the importance of independently completing homework, cultivating students' computational and analytical abilities, as well as the ability to independently solve problems. Students should be encouraged to actively participate in discussions and exchanges in the classroom, and have the courage to express themselves. Teachers should fully utilize modern technological methods and means to improve classroom activity and cultivate students' ability to apply the knowledge they have acquired to analyze and solve practical problems, as well as their abilities in teamwork, communication, and expression. Assessment enables students to understand experimental standards, experimental methods and improve data processing and analysis abilities, examine students' ability to independently solve the problems and write experimental reports, innovation, communication, expressive, and team collaborative abilities. The quality of report writing, literature review ability, self-directed learning ability. Besides, learning attitude can be used as indicators for the achievement evaluation systems. Finally, the performance is given by the practical guidance teacher [9-10].

4 Conclusion

In the planning and construction of the practical teaching reform system for the industrial engineering major, the author focuses on training programs, reforming practical teaching methods and methods. To strengthen the construction of teaching staff, and establish school enterprise cooperation bases, the teaching mode of combining industry, academia and research, establishing a complete industrial engineering laboratory should be implemented. Improving practical teaching evaluation is a significant issue. Establishing a complete set of practical teaching systems, and cultivating a group of students with international perspectives Diversified development of high-end industrial engineering talents can contribute a lot to the teaching evaluation.

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