

# Practice of R&D Back Feeding Teaching Project in Design Course Teaching

Shaobo Cai, Feng Gao

School of Rui'an, Wenzhou Polytechnic, Zhejiang 325035, China

## Abstract

**With the development and transformation of the machinery industry, the task of vocational education serving regional economic development is more clear, which poses a new challenge to the matching between professional classroom teaching and the actual position of enterprises. By grasping the development status and employment demand of industry enterprises, integrate the technical skills required by the actual job into the professional curriculum teaching through cases with real topics as the carrier, and carry out teaching practice by taking design courses as an example. The results show that R&D back feeding teaching can help students exercise technical skills, cultivate innovative thinking, identify with professional prospects, participate in precision employment and better serve regional economic development through the innovation of teaching content.**

## Keywords

**R&D Back Feeding; Case Teaching; Higher Vocational Colleges; Course Teaching.**

## 1. Introduction

With the rapid development of local and regional economy and the continuous application of new technologies in enterprises, the hardware and software skills required by relevant professional technicians are also undergoing rapid iteration and updating. For mechanical design and manufacturing practitioners, relevant design and manufacturing enterprises have higher and higher requirements for the feasibility, reliability, design efficiency, production and manufacturing cost of their designed products. On the other hand, with the continuous clarification of the goal of serving regional economic development in higher vocational colleges [1,2], the docking between higher vocational classroom teaching content and the actual production and development of industrial enterprises is an important problem of back feeding service of teaching and scientific research.

Since the proposal of "improving the vocational education and training system, deepening the integration of industry and education and school enterprise cooperation", major universities have carried out exploration with distinctive local characteristics in relevant courses, majors and practice bases [3,4]. At the same time, colleges and universities also actively carry out R&D back feeding teaching activities, and have made many explorations and attempts in improving and improving classroom teaching effects. Gu Weidong, School of mechanical and electrical engineering, Changchun University of technology, and others, through case teaching and R&D process guidance, pay attention to the consistency between students' learning and practical work in the school, highlight application and pertinence, take students as the center, results as the guidance, teachers and enterprise engineers as the main body, and carry out case-based teaching and education [5]. Ouyang Xinping and Qin Jie, School of energy and power engineering, Shanghai University of technology, carried out the teaching practice of introducing scientific research cases into several energy and power courses according to the strong experimental and engineering characteristics of energy and power courses. The effect feedback

was good, which improved students' interest in learning, enhanced students' concentration and promoted students' understanding of the course content [6].

To achieve the goal of made in China 2025, we need a large number of talents who have a solid foundation in mechanical design and master computer-aided design innovation tools, which will also be the core competitiveness of our students in future employment. As an important subject serving the regional economic development, higher vocational colleges need to deeply grasp the development status and employment demand of industry enterprises, take students as the basis, and integrate the technical skills required by the actual job into the professional curriculum teaching through cases with real topics as the carrier, to better understand the development direction and efforts of current industry enterprises. Therefore, it is very necessary for students to master the key technical skills of mechanical design and manufacturing engineers with the help of R&D back feeding teaching.

## 2. Research Basis

The R&D back feeding teaching is an important feature of higher vocational education to improve the quality of talent training. In order to promote the training of innovative and entrepreneurial talents for the application of new technologies and the integrated development of industry-university research and innovation, improve the talent training quality of higher vocational education, and promote the establishment of high-level vocational colleges, the school strongly supports the organic combination of various topics, inventions, technical service achievements and professional courses to form curriculum teaching cases with distinctive local characteristics and prominent industry characteristics, cultivate technical talents who really understand technology, practice and grounding. Mechanical design and manufacturing are a traditional specialty, which cultivates senior engineering and technical talents who have the basic knowledge and application ability of mechanical design and manufacturing and can engage in design and manufacturing, scientific and technological development, application research, operation management, and sales in the field of mechanical manufacturing in the first line of industrial production.

However, with the continuous change of service objects, the technical skills that students need to master are also changing. Students need to carry out computer-aided design of key parts on the basis of understanding typical mechanical structures. Through the course, students can understand the overall structure of typical machinery, the detailed structure of each assembly, assembly relationship and its basic working principle, be familiar with the application of typical mechanisms and general parts in automotive, automation equipment and other mechanical products, and be able to skillfully use SolidWorks, Auto CAD and other software for computer-aided design of typical mechanical structures and automotive parts. Strengthen students' professional and technical skills in combination with practical training.

In the teaching of the existing courses, it mainly helps students understand the basic structure and working principle of main auto parts through theoretical explanation, combined with rich teaching means such as video data, disassembly practice in the training room, physical mapping and virtual assembly, and can carry out computer-aided design of main auto parts through professional software. The course content is mainly composed of 11 modules such as industry status, piston modeling and clutch modeling. At the same time, combined with various cases, students can understand the development of domestic automobile industry and the real needs of surrounding enterprises, stimulate students' patriotism, cultivate national pride, guide students to be familiar with industries, enterprises and posts, and encourage students to be brave and work hard, and participate in industry construction.

### 3. Practice Process

#### 3.1. Innovating of Teaching Content

Since the concept of intelligent manufacturing has been deeply rooted in the hearts of the people, the design demand of local traditional pillar industries and their supporting tooling and non-standard automation products is increasing day by day, and the requirements for design quality and efficiency are also increasing. The traditional computer aided design related teaching content pays attention to the design basis and the basic operation of software, and there is a gap in the grasp of the new development and trend of the industry. Therefore, it is very necessary to integrate teachers' real product development projects into teaching projects and constantly innovate teaching contents. Connect textbooks with real projects, such as enterprise projects and discipline competitions, and organically integrate them into curriculum teaching. Figure 1 below shows the guiding works of some projects and subject competitions in the course.

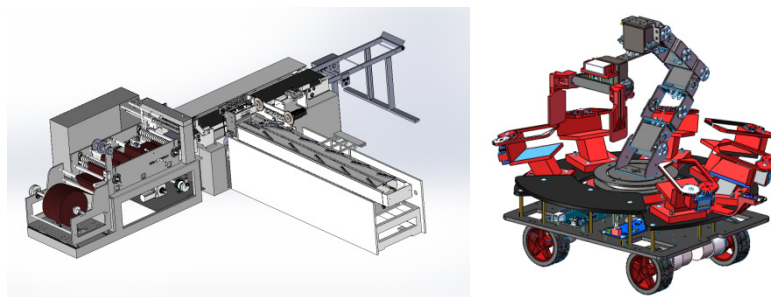


Figure 1. Guiding works of some projects and subject competitions of the course

#### 3.2. Honing of Technical Skills

Through the survey of graduates and enterprise visits, it is found that there is a large gap between the relatively solidified technical skills learned by graduates during their study in school and the rapid development and change of enterprise production practice. Therefore, it is necessary to deconstruct, organize and gradually carry out targeted in class training for the technical skills of the real posts of the enterprise and the actual needs of project design. The technical skills do not care about the breadth, but care about the precision and use. Figure 2 below shows the design logic of course technical skill training.

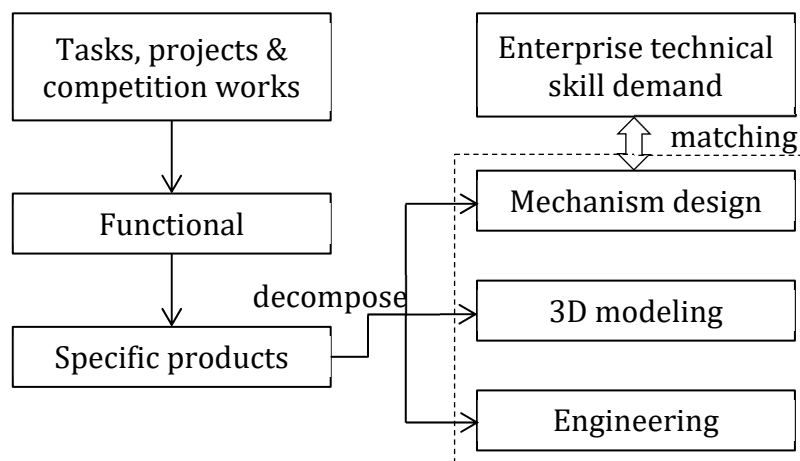


Figure 2. Design logic of course technical skill training

### 3.3. Divergent Innovative Thinking

Innovation is the first driving force leading development and the strategic support for building a modern economic system. For every enterprise and every person, innovation is indispensable for the development of enterprises and the growth of individuals. Therefore, it is necessary to integrate innovative thinking into computer-aided design teaching, run through the whole process of structural design, modeling and drawing, carry out brainstorming and comparative analysis for real design projects, encourage creative design to integrate into in-class training projects, and make new ideas belonging to students on old projects.

### 3.4. Professional Prospect Recognition

The traditional split computer-aided design teaching does not integrate the concrete content carrier and the application scene of the learned technical skills. Therefore, by integrating topics, patents, competitions and other contents into teaching, and helping students understand where the learned contents can be applied, what problems can be solved and what social value can be created. It can help students form a more concrete impression of their posts, majors and industries, and it will be easier to recognize the development prospects of their majors and stay in the industry.

### 3.5. Precise Employment Orientation

By studying the connection process between students' learning process and enterprise posts, analyze the specific contents of classroom learning and post application, and connect the specific knowledge points to the course (as shown in Figure 3). Make accurate breakthroughs through the teaching of corresponding modules to introduce students to the actual products and job needs of various enterprises. Guide students to practice in relevant enterprises to achieve precise employment.

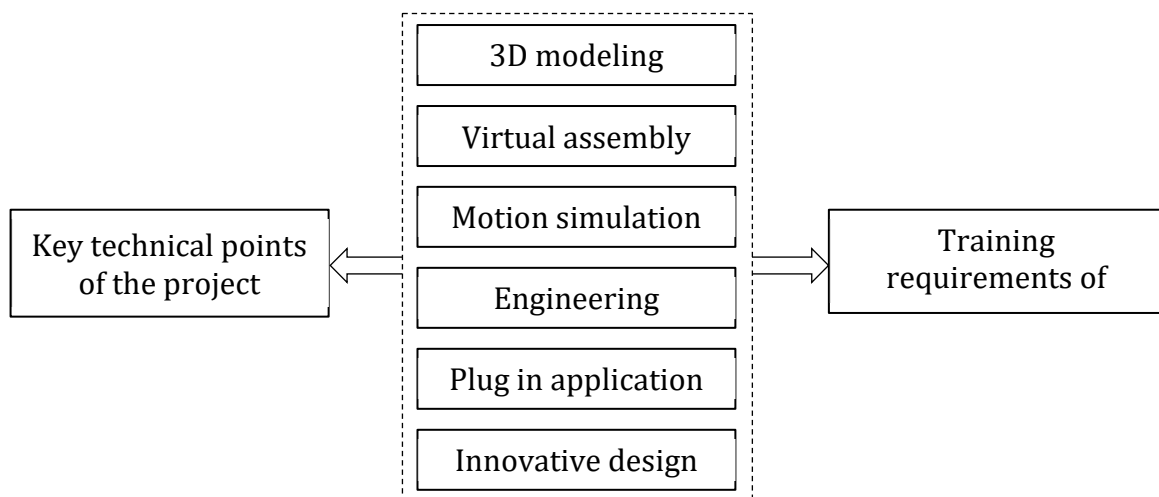


Figure 3. Practice content docking precision employment

## 4. Conclusion

Through the implementation of R&D back feeding teaching and applied to the teaching of students majoring in mechanical design and manufacturing, the main significance is as follows.

(1) With the rapid development of the industry, integrating teachers' R&D projects into teaching cases can improve the lag of teaching content, so that students' teaching content in class needs to keep up with the development of regional industry enterprises.

(2) The design integration and modularity of enterprise products are becoming more and more prominent. Selecting more advanced design concepts and design tools used in R&D projects and carrying out applied teaching can greatly improve the design efficiency and design reliability.

(3) In the process of R&D back feeding teaching, students can go back to teachers' scientific research projects and put forward their own views on some of them, to improve students' learning enthusiasm and explore innovative ideas.

(4) The close connection between the teaching content and the actual position will better help students understand the surrounding enterprises, be familiar with the work tasks and requirements given by the enterprise products and positions, and be more willing to work in relevant enterprises after graduation, which will help to achieve accurate employment.

## Acknowledgments

This work is supported by the Comprehensive research project of R&D feedback teaching in Wenzhou Polytechnic in 2020 (WZYYFFP2020007) and the research project of China Vocational Education in Zhejiang Province in 2020 (ZJCVD06).

## References

- [1] Y. Zhang, B.Y. Guo. Embracing the industry: stepping into the era of deep integration of industry and Education 2.0 (China Higher Education, China 2017), p.46-48. (In Chinese).
- [2] Z.J. Gu, F. Gao. Exploration on the reform of the mixed school running mode of post employment oriented "dual yuan and nine Communists" (Forward Position, China 2017), p.97-101. (In Chinese).
- [3] X.W. Sun. On case teaching in Higher Vocational Education (China Adult Education, China 2010), p.117-118. (In Chinese).
- [4] F. Gao, X. Xiao. On the connection between summer practical activities and professional practical education (Modern Vocational Education, China 2016), p.70-71. (In Chinese).
- [5] D.W. Gu, Q.H. Li, G.J. Cui. Research on school enterprise cooperative teaching mode based on case teaching / R & D process (Research and Exploration in Laboratory, China 2020), p.207-210. (In Chinese).
- [6] X.P. Ouyang, J. Qin. Research teaching practice of integrating scientific research cases into energy and power courses (Journal of Higher Education, China 2020), p.133-136. (In Chinese).