ISSN: 2688-8653

Research on the Teaching Reform of "Course Design for Machinery Design" Based on the Back-Feeding Teaching of Scientific Research

Qipeng Cao

School of Wenzhou Polytechnic, Wenzhou 325000, China

Abstract

Teaching and scientific research complement each other in the process of talent training. To carry out scientific research back-feeding teaching for the important course of mechanical major "Course Design for Machinery Design", focusing on the academic frontiers in the field of manufacturing, combining the team's own scientific research results, supplementing teaching cases, enriching teaching content, improving teaching methods, and benefiting students' understanding of the course content Learning and mastering is also conducive to broadening students' academic horizons, which not only allows students to consolidate theoretical knowledge points, but also cultivate their innovative spirit.

Keywords

Teaching Reform; Research Back-Feeding Teaching; Mechanical Design; Course Design.

1. Introduction

"Course Design for Machinery Design" is a practical course of professional ability for mechanical majors. It is a comprehensive design for students to comprehensively use the knowledge of mechanical design and related prerequisite courses to analyze and solve practical engineering problems train. The course adopts a task-driven teaching method, selects and designs a representative mechanical device-Reducer, so that students can master the general methods and steps of mechanical device design. At the same time, in view of the hope that through the practice of this course, students will learn to think independently while learning the purpose of teamwork, so students are required to divide the work to complete the various components of the course project, and then comprehensively complete the entire project.

The reducer is widely used in modern machinery. It is generally used for low-speed and high-torque transmission equipment. The power of the motor, internal combustion engine or other high-speed operation is meshed with the large gear on the output shaft through a gear with a small number of teeth on the input shaft of the reducer. To achieve the purpose of deceleration, the purpose is to reduce the speed and increase the torque.

This research combines real enterprise projects with student classrooms, so that students can get in touch with the projects actually produced by the enterprise during the course design process, and cultivate students' ability to analyze and solve practical engineering problems by applying the knowledge of institutional design and other related prerequisite courses. To lay the necessary foundation for working in the machinery industry in the future.

ISSN: 2688-8653

2. The Purpose of Scientific Research Back-Feeding Teaching

2.1. Improve Learning Methods and Cultivate Students' Independent Thinking Ability

In the course design, students can master the relevant theories and foundations of mechanical product design through case analysis, group discussion, and mutual evaluation between groups. Taking the actual reducer produced by the enterprise as a case, through theoretical calculations, shaft analysis and other practical links, students are encouraged to find information by themselves, discuss and work together among students. To enable students to master the design, calculation, analysis and innovation capabilities of gears, shafts, keys and other general mechanical parts, improve their ability to research and analyze mechanical equipment from a system perspective, and lay a foundation for the development of mechanical product technology and innovative design.

2.2. Improving Students' Professional Quality with Enterprise Projects

Through participating in the teacher's enterprise project, students are exposed to the needs and problems encountered in the actual enterprise. Students combine independent learning based on the required knowledge to improve their professional skills, reflect on their own learning deficiencies, and continuously improve their own Learning methods, strengthen the training of weak links, and enhance core competitiveness; at the same time, students can transform their own curriculum design results with the help of the instructor to realize the combination of theoretical design and actual production, and the combination of theoretical learning and job ability improvement to improve Student employability.

2.3. Combine Actual Projects with Teaching to Promote the Improvement of Teachers' Professional Quality

The design of the real project curriculum also puts forward higher requirements for teachers. Teachers are urgently required to have more comprehensive knowledge and practical ability, improve teachers' professional quality and scientific research level, and form a benign interaction with students to achieve the "research and development of teaching". The effect, to realize the teaching and learning, especially for the rapid growth of young teachers has a very large role in promoting. At the same time, the study of the teaching process can help teachers to understand and explore the interaction between various factors in the classroom teaching process as a whole, and is beneficial to the teaching process of the mechanical product development and design course from the aspects of teaching design, teaching implementation, and teaching evaluation. Carry out dynamic grasp. Enhance teachers' research awareness, reflect, analyze and solve problems encountered in teaching practice from the perspective of researchers, and integrate daily teaching work with scientific research work.

3. The Implementation Plan of Scientific Research Back-Feeding Teaching

3.1. Project-Driven to Promote the Learning of Knowledge Points

At present, the teaching process of "Course Design for Machinery Design" is still dominated by teachers and professors, and students design according to the design process mechanized, lacking thinking. This teaching reform emphasizes project-driven, clear project requirements, and implementation of participation activities under the guidance of project requirements. For example, taking a worm gear box with exhaust function as a case, not only the theoretical calculation, shafting design, and worm gear design requirements in the design process of the turbine box must be considered, but also higher requirements are put forward in terms of sealing and processing technology. In the process of considering the actual application of the turbine box, the problem caused by the increase of internal pressure, how to solve the actual

ISSN: 2688-8653

problem. During teaching, teachers design teaching content in a targeted manner, clarify the task objectives of each lesson, grasp the time and control the entire teaching process during the teaching process, and combine the key points of each lesson with actual cases, so that students can in this case, learn the basic knowledge points and skills of mechanical design.

3.2. Changing Traditional Classrooms into Inquiry-Based Learning for Students

Transform traditional passive learning into student exploratory learning, transform traditional knowledge-based learning into knowledge-applied learning, and transform traditional single-type learning into comprehensive learning. Propose tasks-group discussion-students actively search for and obtain resources-complete tasks, and use information resources to achieve active search, group cooperation, and group mutual evaluation. In the course design, the traditional sitting-in-row classroom is transformed into a round-table classroom. The class is divided into 5-6 groups, and each student is mobilized through case analysis, group discussion, plan optimization, and centralized teacher comments. Enthusiasm, guide students to actively participate and think independently, focus on cultivating students' interest and ability to learn independently, delve into problems, and explore innovation, fully display the wisdom and talents of individuals and groups, tap the potential of each student, and improve students' practical operation ability, to truly transform knowledge mastery into the application of knowledge and skills. Cultivate students' independent learning ability and teamwork ability, and improve students' professional quality.

3.3. Online and Offline Hybrid Teaching Mode

Independent learning is combined with information resources. The course designs the teaching process with the idea of “learning by doing, doing while learning, and progressive ability”, and adopts a mixed online and offline teaching mode. Use online course construction, live video, video shooting and uploading and other information methods. Watch videos of related knowledge before class, push preview knowledge and pre-class testing, and use the preliminary knowledge reserve of the platform; class exercises and class tests are released in class, students discuss in groups, and gradually explore and complete tasks independently. Teachers explain the important and difficult points in the design process. Existing problems; assignments are assigned after class, and student groups evaluate each other to consolidate the knowledge learned.

3.4. Solve the Problems Encountered with the Attitude of "Craftsman Spirit"

After studying the course design, students cannot apply and transform the knowledge they have learned due to time and space constraints, nor can they check whether their design results are reasonable and correct. This project uses the actual products produced by the company as the carrier. After the students have completed the design, they can be prototyped and improved in the company after the teacher's improvement and improvement, and some students can participate in the subsequent physical production process. By turning one's own design into something within reach, it can strengthen students' engineering literacy and professional ethics awareness, establish correct engineering ideas, stimulate students' innovative thinking consciousness, and cultivate the spirit of "craftsman".

4. The Teaching Effect of Scientific Research Back-Feeding Teaching

4.1. Strengthen the Students' Independent Learning

The teaching content of the "Course Design for Machinery Design" course is oriented to the actual production requirements of the enterprise, which enables the interactive relationship between the knowledge points, skill points of the course content and social production practices, and changes the knowledge points, important and difficult points and knowledge

ISSN: 2688-8653

structure of the traditional course content. The points are integrated into the case and allow students to learn the key points of the course independently. A complete online course has been built to allow students to learn through the materials released by teachers and access to relevant materials. Pay attention to the pertinence, practicability and generativists of the course content. The curriculum standards should be as close as possible to the technology and skills required by the industry, which has cultivated students' independent learning ability and promoted the quality education of higher vocational students.

4.2. Improve the Professional Level of Teachers

The curriculum of real projects has made teachers make great changes in teaching methods and course preparation. Teachers must not only be able to clearly explain the basic knowledge points, but also be able to use relevant skills flexibly, and gradually analyze the actual needs and problems encountered by the company. Students determine the design plan and complete the design by searching for materials. Teachers need to fully guide the students in the entire design process, point out the deficiencies in the design, affirm the good ideas in the design process, and even apply the students' good ideas to the enterprise project design In, enterprise projects and actual teaching complement each other. Therefore, the teachers' self-quality and R&D level have been continuously improved.

4.3. Improve the Construction of the Curriculum and Evaluation System

Through the online and offline hybrid teaching mode, a complete online course is established, and online courses and offline courses are combined to establish a complete evaluation system. Breaking the traditional curriculum evaluation model that ignores students' participation in the learning process, the focus of classroom teaching evaluation shifts to students' learning before class, class behavior, process participation, practical ability, communication and cooperation, and evaluation after class. Pay attention to process evaluation, discover the needs of students in time, help students understand themselves, build self-confidence, and stimulate their internal development motivation, to promote students to break through and innovate on the original knowledge level and realize individual value.

5. Conclusion

The research takes the actual project of the enterprise as a design case, and introduces project-driven, student-exploratory learning in the course teaching of "Mechanical Design Curriculum Design", adopting online and offline mixed teaching mode, effectively combining R&D and practical courses. It has strengthened students' ability to learn independently, improved teachers' professional level, perfected the construction of curriculum and evaluation system, and improved students' professional quality.

References

[1] Xue B , Fang-Fei L I ,Miao S D . The Practice of Curriculum Revolution of "Composite Material" Using Research Back-feeding Teaching[J]. Education Teaching Forum, 2019.

[2] Weng G Q , Huang F T ,Nan Y R , et al. Multi-directional Integration Mechanism on Scientific Research Back-feeding Teaching of Emerging and Characteristic Specialty[J]. Journal of Electrical & Electronic Education, 2017.

[3] Huang H , Chang S ,Liu Z , et al. Promoting "Three-Whole Education" through Back Feeding Teaching of Scientific Researches[C].2020 6th International Conference on Social Science and Higher Education (ICSSHE 2020). 2020.

[4] Konrad J. Schönborn, Anderson T R . Bridging the educational research-teaching practice gap[J]. Biochemistry and Molecular Biology Education, 2010.

ISSN: 2688-8653

[5] Robertson J , Bond C . The Research/Teaching Relation: A View from the Edge[J]. Higher Education, 2005, 50(3):509-535.

[6] Malcolm M. A critical evaluation of recent progress in understanding the role of the research-teaching link in higher education[J]. Higher Education, 2014, 67(3):289-301.

[7] Rijst R. The research-teaching nexus in the sciences : scientific research dispositions and teaching practice[J]. iclon leiden university graduate school of teaching, 2009.