

# Application of Project Teaching Method in Talent Cultivation of Material Processing in the Iron and Steel Secondary Processing Industry

Chenggang Pan \*

Key Laboratory for Ferrous Metallurgy and Resources  
Utilization of Ministry of Education  
Wuhan University of Science and Technology  
Wuhan, China  
pcg2000@163.com  
\*Corresponding author

Qin Xiao

Key Laboratory for Ferrous Metallurgy and Resources  
Utilization of Ministry of Education  
Wuhan University of Science and Technology  
Wuhan, China  
370219757@qq.com

Qingming Chang

Key Laboratory for Ferrous Metallurgy and Resources  
Utilization of Ministry of Education  
Wuhan University of Science and Technology  
Wuhan, China  
qmchang@163.com

Jialin Zhou

Key Laboratory for Ferrous Metallurgy and Resources  
Utilization of Ministry of Education  
Wuhan University of Science and Technology  
Wuhan, China  
512928195@qq.com

**Abstract**—This article expounded the connotation of project teaching method, and put forward teaching ideas of project teaching method according to the characteristics of iron and steel secondary processing (module2) of material forming and control major. It is helpful to stimulate students' interest in learning, take exercise students' ability of self-study and engineering practice, and make the teaching and learning to get twice the result with half the effort because of application of project teaching method in the direction of iron and steel secondary processing.

**Keywords**-project teaching method; material processing; iron and steel secondary processing; talent cultivation

## I. INTRODUCTION

Main direction of material forming and control engineering undergraduate major in Wuhan University of Science and Technology was metal pressure processing (rolling) direction. The major mainly trained professional and technical personnel for iron and steel enterprises. In order to implement the requirement of state education commission, i.e., wide professional caliber and broad knowledge and employment areas, material forming and control major in our school was divided into two modules. Module 1 is the direction of iron and steel rolling, while module 2 is the direction of iron and steel secondary processing (molding, welding and casting) [1]. In recent years, with the malaise of iron and steel industry and the rapid development of automobile, shipbuilding, machinery, household appliances and electronic industry, graduates of material forming and control engineering major in our school employed not only in traditional iron and steel enterprises but also in other industries, such as the auto industry, household appliances industry, electronic industry and machinery manufacturing industry and other industries, account for nearly half of the total graduates. There are several problems by

tracking student employment: (1) the students' theoretical knowledge, old and not in series with each other, disagrees with and demands of enterprises, (2) the engineering practical ability of students is not strong, (3) the autonomous learning ability of students is not strong, so enterprises need to spend a lot of time and money to develop, (4) innovation ability of students is weak, and (5) lack of interdisciplinary talents who master a knowledge of foreign language, computer, control and management. With the development of science and technology and internationalization of the enterprise, the requirement of the iron and steel secondary processing enterprises for material processing talents also keep pace with the times, but talent training system and teaching method of colleges still lag far behind the needs of society. To eliminate the gaps between talent requirements of enterprises and talent training in colleges and universities, teachers must change traditional teaching methods for improving the quality of students. Training students' engineering practical ability is as aim on the premise of combining with the characteristics of discipline and curriculum and stimulating students' interest in learning. Therefore, it is necessary that the project teaching method is introduced into course teaching in the iron and steel secondary processing direction.

## II. SUMMARY OF PROJECT TEACHING METHOD

Project teaching method is a kind of student-oriented teaching methods jointly put forward by the famous American educator Dr. Katz, a professor at the university of Illinois, and Canadian educator Dr Charlie, a professor at the university of Albert [2]. Project teaching method is a kind of teaching methods of construction of teaching theory and promoting the comprehensive development of students. Project teaching method is learning method of constructivism, whose basic characteristics is that the students are the main body of

cognition, and active builders of knowledge meaning. It is a kind of teaching activities through the implementation of a complete project for the purpose of combining theory with practice in class teaching, which fully taps the students' creative potential and improves students' comprehensive vocational ability to solve practical problems. Specific for the following five kinds of ability: the ability of independent learning ; self learning ability; ability to solve the problem of project; ability to solve various social problems; ability of communication between students [3]. Its characteristics are mainly the following several aspects:

(1) Taking the student as the main body. Project teaching method realizes the education purpose of making students master knowledge and eliminating the disadvantages of traditional education mode of indoctrination. All teaching means and methods are to service for this purpose. Students had main body status in the form in the past, but was still in a subordinate passive position in essence. It was difficult to play a role of students' subjective initiative and the main body. On the idea, there is not change from how to cultivate the students into how to provide the best services for the students to become a useful person.

(2) The project teaching method is behavioral orientation teaching method. Behavior orientation is also called the practice orientation, or action orientation. Behavior-oriented teaching method, namely competence-based teaching method, is composed of a variety of teaching techniques, means and methods, guided by occupational activities, and based on cultivating students' ability for the kernel.

(3) The project teaching method closely integrates with the engineering practice. Project teaching method is a kind of student-oriented initiative education activities. Students directly observe, deeply understand and personally experience projects which possess research value or interesting problems of engineering practice in the actual enterprises. So the choice of projects should be closely related to real life or the engineering practice.

(4) Comprehensive abilities of students are training objectives of project teaching method. It is extremely important to train and experience students' comprehensive abilities to solve problems in the process of project implementation, such as thinking ability, practical ability, cooperation ability, information collecting ability and learning ability, etc. Various kind abilities of students are inevitable displayed in the process of project implementation and evaluation, while the completed project is a result of the combined action of various abilities. Students have certain options in the process of implementation task. For example, they can not only choose to work form but also use different methods to accomplish tasks. So evaluation standard for students' projects are multiplicity. When evaluating students' learning results, there are not preset fixed standards to value the student who is right or wrong, while whether logically analyze and scientifically solve problems is as the scores of students in the process of learning and finishing task.

### III. APPLICATION OF PROJECT TEACHING METHOD IN THE TEACHING OF IRON AND STEEL SECONDARY PROCESSING

Subject basic courses and specialized basic courses of the direction of iron and steel secondary processing (module 2) share platform with the direction of rolling (module 1). Specialized basic courses mainly include physical metallurgy, mechanics of materials forming, CAD/CAM of material processing, metallography, physical chemistry, transmission principle, material mechanics and theoretical mechanics. Specialized courses of the direction of iron and steel secondary processing (module 2) adopt single teaching, including principle and process of mold design, Deep processing of materials, principle of casting and welding, injection molding technology, material forming equipment, mechanical properties of metal material, process of casting and welding, materials research methods, professional English, etc. In the process of these specialized basic course and specialized course teaching, teachers break the limitation of various courses, construct courses according to the requirement of project teaching method, and organize teaching contents and distribution of teaching hours around the execution of the actual project.

#### A. Selection of Project

The appropriate project is the key to the implementation of project teaching method. Project selection not only agreed with curriculum content but also combined with the actual production. Adhere to the idea of one centre and two basic points, i.e., the project is as the centre, and curriculum theory content and the actual production are as the two basic points around the centre. The choice of projects should be fully embody theoretical teaching contents. If the theoretical contents of the project involved beyond the current is too much, the difficulty of project implement will increase, and enthusiasm of students to learn will be affected by a lot. If theoretical contents of the project involved is too little, so will affect the learning effect. Project selected must be feasible, and have enough conditions to complete. All courses are divided into multiple projects according to the knowledge systems. For example, in die teaching, including blanking process and die design, bending process and die design, drawing process and die design, die casting process and die design, and injection molding process and mold design. The teacher organizes course teaching around project related. For example, In the project implementation process of blanking process and die design, teachers teach all kinds knowledge involved in project of blanking process and die design, such as elastic mechanics, plastic mechanics, blanking process, die design and professional foreign language related to blanking. The related knowledge and courses are connected in series through the project. Project selection is based on the actual product of enterprises, such as washer blanking process and die design. Actual project can not only stimulate students' interest in the project but also promote students' self-study die related knowledge, such as professional foreign language and material performance testing, etc., to improve the students' ability of applying knowledge and skills to solve practical problems.

#### B. Development of Project Plan

Students set up the project implementation plan according to the selected project, and preliminarily determine blanking

process, die material and structure in the project of blanking process and die design. Students must determine the plan implementation steps and time and personnel arrangement, and explain the design idea and design reason. Teachers give guidance for blanking process and die structure and material established by each group students, point out the defects, and urge improvement of project. This process not only consolidates and applies the theoretical knowledge learned but also requires students to master cost accounting and the ability to make the project plan.

### C. Implementation of Project Plan

Students determine the final blanking process, blanking equipment, raw materials and die materials during implementation of project plan. 3D assembly drawing and part drawings of die are drew using three-dimensional drawing software, such as Pro/E, UG, CATIA, etc. Two-dimensional engineering drawings of die parts are drew using 2-D drawing software. At the same time, students analyze rationality of the blanking process with the aid of finite element software, such as DYNIFORM, and compile NC program of die parts with the aid of the numerical control software, such as MasterCAM or Pro/E, etc. Then, students try to work out die parts made of lead or wax material on CNC machine to verify whether the design is reasonable or not. At last, students must estimate cost of die and blanking part to cultivate students' economic consciousness. This process not only improves students' understanding of theoretical knowledge but also trains the students' application ability to master various engineer tools software(drawing, NC and finite element software). Furthermore, students' practical ability to operate CNC equipment are exercised. At the same time, students have a more intuitive understanding for the composition and characteristics of die. This process of project implementation reflects the students' main body role, embodies the concept of learning by doing, and fully plays students' subjective initiative. Teachers should pay close attention to project implementation, guide project implementation and explain problems for the students.

### D. Inspection and Evaluation of Project

The traditional curriculum evaluation applied one-off closed examination of the theory or open examination of the

theory instead of the practice ability assessment. Project teaching method on students' examination is mainly based on ability during the project implementation. Firstly, students evaluate each other, then teachers evaluate and points out the design characteristics and unreasonable parts of project. Last students revise the errors of project. In the process of evaluation, students know their deficiencies and learn others' strengths, improve and perfect the knowledge system, and put forward new problems. Such as blanking process and die design project, teachers point out reasonable and unreasonable sections in the blanking process design, die structure and materials. Finally students complete a set of reasonable, feasible, low-cost and high efficiency of die design. Through the evaluation, stimulating students' interest in issues of theoretical study, practice and exploring the reality.

## IV. CONCLUSION

The project teaching method can cultivate students' comprehensive application abilities of multi-discipline knowledge to solve actual problems, combine theory with practice closely, and achieve the integration of teaching and learning. The project teaching method applied to the iron and steel secondary processing teaching can stimulate students' interest in learning knowledge, make students deeply understand and master the theoretical knowledge applied to practice, and improve students' engineering practical ability.

## ACKNOWLEDGMENT

The research work was supported by Teaching Research Project of Hubei Province under Grant No. 2013226 and No.2011s001.

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