

# *Micro Course Design in the Context of Craftsman Spirit and Innovation and Entrepreneurship Education*

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**Abstract:** Take the knowledge point of metallographic specimen preparation in the product quality inspection course as an example, and this article explores the path of micro-course construction oriented to the cultivation of craftsmanship and the cultivation of innovative and entrepreneurial abilities. It introduces micro-course design practices that specifically incorporate craftsmanship and innovative and entrepreneurial competency cultivation methods to enhance the usefulness of micro-course content.

## 1. Introduction

In December 2016, General Secretary stressed at the National Conference on Ideological and Political Work in Colleges and Universities that the main channel of classroom teaching should be used so that all kinds of courses and ideological and political theory courses can go in the same direction and create a synergistic effect of educating people. At present, universities are vigorously promoting the construction of curriculum-based ideological and political projects, requiring teachers of professional courses to organically integrate professional knowledge with ideological and political elements and use various teaching methods and means to influence students' ideological and political awareness in a subtle manner<sup>[1-2]</sup>.

With the advantages of open resources, prominent themes and short, concise courses, micro-course has gradually become an important tool for teaching reform. Micro-courses have proven to be an effective supplementary form of classroom teaching. The course has been designed to meet the needs of the course by combining professional knowledge micro-courses with the elements of the course and designing "Civics + Knowledge Micro-courses". In order to promote the organic integration of thinking and politics education and professional courses on materials forming and control engineering, a series of "Great Craftsman + Knowledge" micro-courses and "Innovation awareness + Knowledge Points" micro-courses<sup>[3]</sup> are produced to vigorously promote the glorious deeds and great achievements of outstanding contributors in metal materials-related fields. The micro-courses are also used in teaching practice to motivate students to learn from outstanding people, to be unafraid of difficulties, to forge ahead, to innovate, to climb to new peaks in technology and to contribute to the technological progress of China. In the steel quality inspection course, the micro-course can be an introduction to the course, interpretation of national standards, demonstration of the operation of inspection methods, etc. The steel quality inspection micro-course is a demonstration of the operation of an inspection method in about 10 minutes, using multimedia

technology.

## 2. Course Description

The course "Product Quality Inspection" is one of the professional elective courses for students of Material Forming and Control Engineering. Through this course, students can learn more systematically the knowledge of rolled steel acceptance and the basic knowledge of rolled steel quality inspection, standards and norms, master the content and requirements of quality inspection work, with the ability to test steel inspection and reasonable selection of materials.

Through the theoretical teaching of the course, students should achieve the following course objectives.

(1) To master the knowledge of acceptance of rolled steel and the basic knowledge of quality inspection of rolled steel, national standards, industry standards and foreign standards

(2) Master the chemical composition of steel inspection methods, with the ability to choose a reasonable test method.

(3) Master the macroscopic inspection methods of steel; be able to use the metallographic teaching platform to prepare microstructure observation specimens, and have the ability to identify microstructure.

(4) Be able to standardise the operation of testing machines for mechanical properties testing of metal materials.

(5) Master the inspection methods of process performance test, physical performance test, chemical performance test and non-destructive test of metal materials.

The focus of the knowledge point of metallographic specimen preparation is the process of preparation of metallographic specimens and tissue observation. In the teaching process of the course, we insist on the combination of value leadership and knowledge teaching, and cultivate the craftsmanship of truth-seeking and pragmatic, practical innovation and excellence in theoretical teaching.

## 3. "Great Craftsman + Knowledge" micro-courses design

Product quality inspection is a theoretical course and the micro-course can make up for the fact that students receive only theoretical knowledge and not enough practical experience. Metallographic specimen preparation is a very important part of metallographic research and is an important knowledge point in the product quality inspection course, which includes specimen interception, specimen mounting, specimen polishing, specimen polishing and display of metallographic microstructure.

The basis of testing and national standards are the most important basis for students to learn about the preparation of metallographic specimens. While studying the national standards for sample preparation, students learn through micro-lessons that the national standard for metal microstructure testing methods was first published as GB-T 13298-1991 Metal Microstructure Testing Methods and was later replaced by GB-T 13298-2015 Metal Microstructure Testing Methods. The national standard includes specimen preparation, two cases of specimen selection, a schematic diagram of the test surface, banding, a section on "specimen marking", a section on vibratory polishing, a section on microscopic illumination, a section on image analysis, on-site metallographic examination and commonly used metal etchants. The Chinese national standards development process is divided into nine stages: pre-stage, project stage, drafting stage, consultation stage, review stage, approval stage, publication stage, review stage and revocation stage. Each point in the updating of the national standards reflects the upgrading of testing equipment and the increasing sophistication of testing methods, and is the result of the work of

generations of scientists in the materials field.

When explaining the method of making a pipe weld, the influence of the spirit of excellence in the making of the sample is emphasised. A number of experts related to welding are introduced and some video examples are used as supporting resources for students. Among them are Pan Jiluan, a welding expert who has made significant contributions to the localised welding of components for China's nuclear power industry, Li Wanjun, a master of welding high speed trains, and Gao Fenglin, an expert in rocket heart welding. The vivid cases were put in front of the students to realize the "craftsmanship", "ideals and beliefs", "professional ethics" and other thinking and political elements into it, which further stimulated the students' love for the profession and interest in learning. This further stimulated students' love for the profession and their interest in learning, and also motivated them to study hard. When explaining the operation of grinding samples, students were guided to pay attention to details, be meticulous and strive for excellence when operating, and stressed the importance of practical operation, teaching students that practice makes perfect.

#### **4. "Innovation awareness + Knowledge Points" micro-courses design**

The microstructure analysis of metallographic specimens after preparation is inseparable from the metallographic microscope. When explaining the use of the metallographic microscope, the actual operation of the microscope can be demonstrated in the laboratory, so that students can learn the more abstract knowledge points in the classroom through a realistic environment, enhancing students' interest in the classroom and the enthusiasm of teachers to participate in the microteaching. Teachers explain the operation and at the same time naturally introduce the experiment using advanced experimental equipment development and manufacturing process. It can reflect Chinese wisdom, Chinese power, Chinese technology, cultivate the spirit of exploration and innovation consciousness, enhance students' innovative literacy, while enhancing students' national sentiment, establish the belief of self-improvement and self-reliance, and cultivate socialist core values.

Students always experience unevenness, many scratches and uneven corrosion during the preparation of their specimens. In response to these questions, when observing with a microscope, the teacher can analyse and comment on the specimens according to the marking criteria of the national professional competition, asking questions and leading students to think positively. For example: How can metallographic specimens be prepared quickly and well? What are the hazards of shallow specimen corrosion? What is a false phase of tissue? What are the components of the tissue? How do you choose the right corrosion fluid? How can grinding ensure the flatness of the specimen and so on? The micro-lesson contains both knowledge, methods and questions that can quickly grab the attention of students. Teachers can guide students to find information and analyse solutions to problems after the lesson, so that the content of the micro-lesson can be fully absorbed.

The introduction of appropriate questions in the micro-lesson enhances the initiative of students' learning and changes the passive learning mode of students in the past, from a passive mode to an active learning mode.

The micro-lesson covers the scoring criteria for metallographic preparation for the National Student Metallographic Skills Competition at national level, guiding students to compare their preparation results with the competition scoring criteria. Students are asked to analyse the shortcomings of the samples produced and develop a feasible solution. Teachers focus on student knowledge generation, allowing students to sense the process of knowledge generation while developing their sense of exploration and innovation. The teaching of micro-courses emphasizes students' independent inquiry, through communication and cooperation to find solutions to problems, and in encouraging students to use strategies for problem solving to judge, compare and optimize under diversity. At the same time, students' individual needs are fully respected. The

teacher acts as a listener, guide and organiser. Let students better play their own strengths and develop their own abilities in the classroom.

## 5. Conclusion

This paper discusses the design of micro-lessons for the cultivation of craftsmanship and innovation consciousness, and uses the Product Quality Inspection course as a case study for practice. This paper insists on the student-centred approach and focuses on the ideological elements of the key knowledge points of the course, so that the learning of professional knowledge points is organically integrated with the cultivation of craftsmanship and innovation consciousness. The next step will be to strengthen the top-level design of the micro-course, focusing on improvement and perfection, so as to help create an excellent atmosphere for "dual innovation" education.

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3) The construction course of ideological and political theories teaching of Liaoning Institute of Science and Technology: plastics processing equipment.

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