

Exploration and Practice on the“Mechanical Engineering Materials”Under the Background of Ideological and Political Education

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Abstract: Based on the teaching research of the“Mechanical Engineering Materials”course of online and offline hybrid teaching mode,this paper introduces the teaching mode of curriculum construction,the goal of ideological and political education in the curriculum,and elaborates the main integration points of ideological and political education.

Keywords: Curriculum Politics;Engineering Materials;Teaching Effect

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“Mechanical Engineering Materials”is a compulsory technical foundation course for various mechanical majors in higher education institutions.With the aim of cultivating applied talents,it aims to cultivate students with basic theoretical knowledge of mechanical engineering materials,that is,mastering the structure and performance of common mechanical engineering materials,mastering the basic theories of metal crystallization and binary alloy phase diagrams,mastering the heat treatment methods and processes of steel,and mastering the types,grades,performance characteristics,and applications of common mechanical engineering materials.Students’practical abilities are cultivated and their application of knowledge is strengthened,so that they can select reasonable materials for mechanical parts based on their usage conditions and performance requirements,and develop reasonable heat treatment processes.They are able to analyze and study material issues in mechanical engineering,and capable of utilizing basic experimental skills such as metal metallographic analysis,hardness testing,and heat treatment processes in a reasonable manner.

1. Teaching Mode of Curriculum

At the beginning of the course,the teaching mode was mainly classic classroom blackboard teaching,with occasional multimedia teaching,some of which fell behind the development trend of modern teaching.The course team is well aware that modern and digital teaching and management methods are the only way to improve teaching quality,ensure teaching effectiveness,and improve teaching efficiency.

At present,the curriculum team teachers have become proficient in multimedia teaching,and with the improvement of school teaching conditions,the teaching status of the course(teaching work documents,classroom teaching,teaching reform measures,teaching practice links,exam systems,etc.)has also been improved to a certain extent.The course team has built an online course for“Mechanical Engineering Materials”based on the Xuexitong Learning Platform,providing students with rich online teaching resources.The online resources mainly include short teaching videos,various test questions,assignments,discussion questions,actual production videos,course ideological and political resources,and links to book resources provided by the platform.These resources have laid a good foundation for carrying out blended teaching reform.

The curriculum team focuses on the students,the learning effect of the students,and the development of the students,and the content

is distributed according to the teaching“Pareto principle”.Primary cognition is mainly arranged as online teaching content,accounting for 20%,and advanced cognition is mainly arranged as offline teaching content,accounting for 80%.According to the knowledge points,the course content is divided into declarative knowledge points and procedural knowledge points:procedural knowledge points are arranged for online teaching more than offline teaching,and declarative knowledge points are arranged for online teaching less than offline teaching.

2. Educational Goals of Ideological and Political Curriculum

To achieve the goal of improving teaching quality and achieving training objectives,and to form an effective mechanism to promote the continuous development of the course,based on existing conditions and the current situation of the course,this course has gradually improved various relevant elements of the course.Based on professional certification,an innovative course syllabus has been developed and continuously improved based on the actual operating results during the teaching process.The curriculum team always adheres to the fundamental task of cultivating morality and talents,and strives to cultivate applied talents who meet the needs of national and regional economic and technological development,meet the development positioning of mechanical majors,and serve the manufacturing industry.The teaching content of the course not only learns the professional knowledge of mechanical engineering materials,but also integrates value shaping,knowledge transmission,and ability cultivation,integrating values into knowledge transmission and ability cultivation,helping students shape correct worldviews,life views,and values.This course focuses on strengthening students’engineering ethics education,integrating ideological and political education elements(such as values,spiritual pursuits,etc.)into various aspects of teaching,and subtly influencing students’ideological awareness and behavior.Students’positive learning attitude is cultivated to have the awareness and ability to continue learning;students’patriotism,national pride,and humanities and social science literacy are cultivated to establish self-confidence;students’good character is cultivated to help them possess basic professional ethics,love their work,dedication,and responsibility;students’engineering quality,engineering awareness,and the spirit of striving for excellence as a great country craftsman are cultivated,and students’patriotism and mission are stimulated to serve the country through science and technology.

3. Main Integration Points of Ideological and Political Education

According to the nature of the professional courses in mechanical engineering materials,the curriculum team combines the impartation of professional knowledge with the overall development strategy of the country,naturally integrating elements such as patriotism,the major policies of the Party and the country,and deep and firm patriotic education,to achieve subtle cultivation of students,cultivate their patriotism,strengthen educational effectiveness,and improve their overall quality.The main integration points of course content and ideological and political education are shown in Table 1:

Table 1. Curriculum content and main integration points of ideological and political education

Numbers	Content of curriculum	Elements of ideological and political curriculum	Educational objectives of ideological and political education	Teaching method
1	Curriculum overview	The materials include China’s long-standing history of metal material invention and application.	Stimulating students’ sense of national pride and patriotism	Inquiry teaching and case method
2	Mechanical properties of metal materials	Advanced hardness testing methods in China are introduced to students through a video presentation of the online hardness testing system for car brake drums.	Enhancing students’ sense of national pride,patriotism and engineering awareness	Inquiry teaching,-case method and heuristic teaching
3	Heat treatment of steel	The content includes the great invention history of China’s hundred steel mills,the quenching of ancient swords(mud covered local quenching,horse urine quenching method),and the surface quenching technology of camshafts in modern industry.	Cultivating positive outlook on life and learning attitude,sense of national pride,patriotism,and sense of responsibility and rigorous and realistic scientific and humanistic spirit	Inquiry teaching,-case method,project-driven teaching,discussion based teaching
4	Austenitic stainless steel	The false introduction of a certain stainless steel insulation cup seller is analyzed.	Cultivating students’ concept of seeking truth from facts and being a good person	Case method,project-driven teaching

5	Comparison of pearlite, sorbite, troostite	By analogy, Chairman Mao's quote "only by comparison can one discern" is derived.	Cultivating students' rigorous as well as their love for the Party and patriotism	Case method and heuristic teaching
6	Engineering material selection	Videos of material selection and heat treatment process methods for coal mine support frames are explained.	Cultivating students' engineering awareness and responsibility	Case method and heuristic teaching
6	Hardness measurement	Through practical teaching, students can hands-on operate, integrating theory with practice.	Cultivating students' teamwork awareness and scientific exploration spirit	Practice teaching
8	Observation of metallographic structure	A metallographic microscope is operated to observe the equilibrium phase diagram of iron carbon alloys.	Cultivating students' as well as the craftsmanship spirit of being adept at research and fearless of difficulties	Practice teaching

4. Educational Effects

The ideological and political elements of this course are implicit in the teaching content, and the knowledge and ability goals in the teaching and education goals are quantitatively evaluated through comprehensive assessment results. From the results of the symposium, it can be seen that most students can appreciate the important position of mechanical engineering materials in China's mechanical manufacturing industry. Through course learning, most students possess a serious, rigorous, and realistic craftsmanship spirit, a positive learning attitude, and a sense of national pride. At the same time, they are aware of the gap with developed countries and the significant responsibility of the younger generation.

The teaching reform of this course has greatly enhanced students' awareness of innovation and entrepreneurship, and students have achieved remarkable results in utilizing their knowledge in major innovation projects. The most typical example is the 3D printing technology team of the college's mechanism major, which has repeatedly won national awards in various competitions. In recent years, in the fight against the epidemic, students from the School of Mechanical Engineering have been seen everywhere dedicating themselves to frontline work, making their due contributions to society with their own efforts. Some students, in order to continue their studies and further education, rush to the army for the postgraduate entrance examination. They get up early and study in groups, discuss overnight in dormitories, and sweat profusely in the library, ultimately achieving fruitful results.

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