



The Integration of Ideological and Political Elements in the Teaching Process of Mechanical Engineering Materials and Thermal Processing-- Based on the Engineering Education Certification Model

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Abstract. The report to the Party's 20th National Congress pointed out that "core socialist values should be used to shape the soul and educate people, improve the system of ideological and political work, and promote the integration of ideological and political education in primary and secondary schools." [1] Curriculum ideology and politics is an important direction of curriculum reform in colleges and universities, which can help students establish patriotism, stimulate national pride and cultivate professional ethics. The core idea of "student-centered, output-oriented and continuous improvement" advocated in engineering education professional certification is in good agreement with the essential idea of curriculum thinking and politics. Based on the concept of professional certification of engineering education, the ideological and political education is integrated into the teaching practice of "Mechanical Engineering Materials and thermal processing" course. According to the characteristics of the curriculum, the elements of ideological and political education are systematically designed, and the organic unity of professional knowledge education and ideological and political education is realized through vivid teaching methods, focusing on the effect of education and optimizing the environment of education.

Keywords: curriculum thought and politics; Mechanical engineering materials and thermal processing; Engineering education professional certification; Practice; Teaching reform.

1 Introduction

At the National Conference on Ideological and Political Work in Colleges and Universities, General Secretary Xi Jinping stressed that the ideological and political work in colleges and universities is related to the fundamental issue of what kind of people, how

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I. A. Khan et al. (eds.), *Proceedings of the 2024 3rd International Conference on Humanities, Wisdom Education and Service Management (HWESM 2024)*, Advances in Social Science, Education and Humanities Research 849, https://doi.org/10.2991/978-2-38476-253-8_30

and for whom do universities train[2]. In order to fully implement the spirit of General Secretary Xi Jinping 's important speech, the notice of the Ministry of Education on the issuance of the "Guidelines for the Ideological and Political Construction of College Curriculum" (hereinafter referred to as the "Outline") pointed out that ideological and political education should run through the talent training system, comprehensively promote the ideological and political construction of college curriculum, give full play to the role of each course in educating people, and improve the quality of college talent training[3]. It is an important requirement of the "Outline" to promote the ideological and political construction of the curriculum according to the characteristics of the disciplines. The mechanical and material majors have the characteristics of close relationship with the major needs of the country, which lays a good foundation for the ideological and political construction of the curriculum. At the same time, with the further advancement of engineering professional certification, ideological and political education content such as national feelings has been clearly integrated into professional curriculum teaching. The graduation requirements, curriculum system, curriculum construction and evaluation, talent training quality evaluation and other links involved in professional certification provide an overall implementation path for curriculum ideological and political work, forming a strong support for the development and implementation of curriculum ideological and political work.

In recent years, the author carried out the teaching practice of "Mechanical Engineering Materials and thermal processing" in mechanical and material majors, and explored the construction process of the first-class undergraduate of mechanical engineering major in Ningxia Institute of Technology around the professional engineering education certification model.

Learning from the core concept of engineering education certification system in the course ideological and political construction of engineering majors can enrich the theory and experience of the course ideological and political construction, and further enhance the educational effect of the course ideological and political construction. The Mechanical engineering major of Ningxia Institute of Science and Technology has been committed to cultivating high-level engineering undergraduate applied talents. As a national first-class construction major, it is facing the upcoming professional certification of engineering education. Under this background, the author uses the concept of engineering education professional certification for reference, and carries out the teaching reform practice of curriculum ideology and politics in the professional classroom of mechanical engineering major, and has achieved good results. Taking the course of "Mechanical Engineering Materials and Thermal Processing" as an example, this paper introduces ideas and experience of carrying out ideological and political construction of the course from the aspects of designing ideological and political education elements, innovating classroom organization methods, reforming teaching assessment methods, and feedback on the effectiveness of education, aiming to provide suggestions and references for carrying out ideological and political construction of professional courses certified for mechanical engineering and other engineering education majors.

2 Ideological and political connotation of mechanical engineering materials and thermal processing course

Mechanical engineering materials and thermal processing is a very rich ideological and political education elements of the course, while heat treatment is to ensure the quality and reliability of metal parts of the key core technology, strong support for the goal of manufacturing power, there are a large number of major national needs of scientific and technological achievements of the classic case, these materials can become an important basis for the ideological and political construction of the course. Curriculum ideology and politics and professional knowledge help each other and complement each other. Professional knowledge provides effective support for curriculum ideology and politics education, and curriculum ideology and politics cast the soul of professional education [4]

2.1 Curriculum ideology and politics is an important focus of the implementation of the moral education center link

To cultivate the students from the perspective of disciplines and specialties of ideas, set up the correct home countries as an individual to be able to realize their own development history stage, Thanksgiving national, social and family to give the material base and spirit of supplies, self development direction and siding guidelines, policies and direction of the development of the country, on own initiative will internalization of socialist core values in mind. Metal heat treatment at the same time, fully tap "" professional ethics, emotion and social value factors in the course, motivating students to the development of the individual with the construction of socialist modern power link, was determined to dedicate myself the great rejuvenation of the Chinese nation in [5].

2.2 Curriculum ideology and politics is an effective way to achieve full and all-round education

The ideological and political construction of "Mechanical Engineering Materials and thermal processing" course should pay attention to transforming the principle, value and thinking contained in professional knowledge into thought leading power[6]. Students' awareness of "how to use knowledge" and "where to use knowledge" should be cultivated, knowledge should be applied to the great goal of socialist modernization, and professional knowledge learning should enhance professional awareness of social responsibility, dedication, economic and environmental protection awareness, and at the same time should be combined with the spirit of model workers, labor spirit and craftsman spirit contained in major national projects. Cultivate students to form "persistent focus, excellence, meticulous, the pursuit of excellence[7]" spiritual quality.

3 Learn from the concept of professional certification of engineering education to clarify the ideological and political purpose of the course

The ideological and political construction of professional courses pays attention to the organic unity of educating talents and educating people, and shapes the character of students while implanting knowledge, so that students have the right direction in cognition, emotion and behavior [8]. This idea coincides with the connotation of professional certification in engineering education. While emphasizing the mastery of professional knowledge and skills, engineering education professional certification puts forward higher requirements for students' comprehensive quality and personality quality [9]. The curriculum ideological and political construction pays attention to the correct guidance of students' thoughts, the improvement of students' comprehensive quality, and the cultivation of sound personality, which are the due meaning of engineering education professional certification. It is not only desirable to unify the teaching of professional knowledge and value guidance in the classroom teaching of engineering education professional certification. The requirement of establishing virtue and cultivating people is also the perfection of the professional certification of engineering education.

4 Practical process of ideological and political construction of mechanical engineering materials and thermal processing courses

4.1 Advantages of mechanical engineering materials course construction

Contains many ideological and political elements, ideological and political resources are rich. Materials are the material basis for human survival and development, and the history of human civilization is the history of material development. Materials play an important role in the development of human society. Various materials in the process from scratch, emerged a group of scientists, they contributed their wisdom and efforts, achieved a large number of research results for the development of human society. Many scientists in our country have also made a lot of outstanding contributions, and have accumulated rich historical materials for the development of curriculum ideology and politics. The application of materials in the field of mechanical engineering has also produced a lot of realistic and pragmatic craftsman spirit, which is worth learning from young students. Various large-scale engineering accidents, such as the explosion and disintegration of the US space shuttle Challenge and the sinking of the Titanic, are closely related to the quality of materials in the final analysis. Taking this as an example can cultivate students' sense of responsibility and professional ethics, let students understand the importance of materials and the truth that details determine success or failure, and then emphasize to students the important value of "excellence" craftsman spirit for individuals and society. New materials are one of the two core basic industries of

"Made in China 2025", and most of the "stuck neck" technologies are in key materials, such as the ZTE incident, Huawei chip incident, etc., which can cultivate students' patriotic professionalism and reflect the core values of socialism. Material strength and toughness, crystal defects, metal glass and other courses embody the unity of opposites of materialist dialectics, as well as the law of mass tautometry and negation. This course has rich ideological and political education elements, a wide range of students, well-equipped teachers, and a solid foundation for early work, so it has great advantages to carry out the reform of "curriculum ideological and political".

4.2 Measures for ideological and political construction of mechanical engineering materials and thermal processing courses

4.2.1 Innovative course teaching team construction, in-depth exploration of ideological and political resources contained in the course.

"A qualified teacher should first of all be a morally qualified one, and a good teacher should first of all be a model of teaching and establishing oneself by virtue." [10] The key to the construction of "curriculum ideology and politics" is to enhance the moral awareness and ability of professional teachers.

Improve the ideological and political education ability of team teachers in various ways. Based on the school's talent training characteristics and professional education goals, with the core socialist values and excellent traditional Chinese culture education as the soul and main line, and with professional knowledge as the carrier, it will explore ideological and political elements and educational resources such as curriculum values, philosophical speculation, scientific thinking, innovative spirit and craftsman spirit, formulate curriculum ideological and political education reform plans, and share curriculum ideological and political materials. Explore the construction of "knowledge transfer + ability improvement + moral education guidance" curriculum ideological and political teaching system.

4.2.2 Clarify the teaching objectives of "Trinity" and revise the course syllabus.

Sort out the new teaching goals of the "trinity" of value shaping, ability training and knowledge transfer for mechanical engineering materials and thermal processing courses. Centering on the teaching goals of the course, cleverly integrate ideological and political materials into each chapter of the course, optimize the course content, coordinate the online and offline teaching arrangements, carefully carry out teaching design, expand teaching thinking, and highlight the main position of students in learning. Carry out the basic task of moral education, revise the syllabus of mechanical engineering materials course. Based on the school's educational orientation and curriculum characteristics, the educational objectives of mechanical engineering materials and thermal processing courses with characteristics are scientifically designed (Figure 1). While acquiring knowledge of mechanical engineering materials and improving professional ability, students should establish a correct world outlook, outlook on life, values and good professional quality, understand the professional ethics of the industry and its connotation, guide students to practice socialist core values, promote patriotism,

and generate national pride and professional pride. It also guides students to treat and deal with problems with materialist dialectics, and cultivates students' craftsman spirit of practical diligence, truth-seeking and pragmatic, excellence and practice and innovation.



Fig. 1. Ideological and political objectives of mechanical engineering materials and thermal processing courses

4.2.3 Reconstruct the supporting relationship between curriculum objectives and graduation requirements, and grasp the ideological and political elements in professional knowledge points.

Reconstruct the relationship between course objectives and graduation requirements in chapter learning. Through course teaching, the course objectives of "Mechanical Engineering Materials and thermal processing" should achieve the following curriculum knowledge teaching objectives (Table 1) and ideological and political objectives (Table 2). First of all, we should train students to love the Party and patriotism through course teaching, and improve students' national pride; Secondly, through the country's breakthrough in the field of material key technology, let students realize the importance of materials in the process of national security and national production and development, so as to cultivate students' sense of responsibility and spirit of responsibility; Thirdly, it is necessary to improve students' ability to analyze and solve problems after encountering problems, cultivate students' awareness of production safety and product quality, and then focus on improving students' professional quality, social responsibility and great power craftsman spirit through ideological and political education. Finally, combining the current situation of China's resources, technical level, environmental pressure, etc., to cultivate students' new concept of sustainable development.

Table 1. The relationship between curriculum knowledge objectives and graduation requirements

Curriculum knowledge objective	Supporting graduation requirements and content description	Degree of correlation (H/M/L)
Objective 1: To understand the phase structure and crystallization of metals and alloys; to be familiar with alloy solidification analysis and calculation of binary homogeneous and eutectic phase diagrams; Familiar with the principle of metal plastic deformation, can use dislocation theory to explain metal plastic deformation and strengthening theory, steel cooling transition (pearlite P, bainite B, martensite M), tempering transition importance and purpose	1.3 Master the basic engineering knowledge related to mechanical engineering and have the ability to apply it to solve mechanical engineering problems	H
Objective 2: Students can correctly use the experimental equipment for metallographic preparation, metallographic observation and metal hardness measurement, analyze the experimental results with the knowledge they have learned, and solve the problems in the experiment with the knowledge they have learned	2.2 The ability to understand the diversity and limitations of existing solutions through literature review, analysis or experiment and practice, propose corresponding solutions for general or more general or more complex mechanical engineering problems, and compare and evaluate different solutions.	L
Goal 3: Through learning, students can analyze and judge the materials and process parameters involved in complex engineering problems of material forming, can initially select appropriate blank forming methods, basic processing paths of mechanical parts/products, and can solve general engineering problems by using the basic principles and processes of steel heat treatment, casting, forging and welding. It can apply the relevant principles to the comprehensive analysis of more complex engineering problems	4.2 Ability to conduct theoretical analysis of physical phenomena, material properties and system performance involved in general or more general or more complex engineering problems, or to design overall experimental schemes, build experimental systems, and carry out effective experimental research safely	H

Table 2. Cases of ideological and political elements in different modules

curriculum module	Main teaching content	Curriculum ideological and political education goal
materials Mechanical properties	The introduction dominates the whole situation and occupies an important position in teaching. Need to focus on explaining. The teaching goal is to make students have knowledge about the course Simple understanding, grasp the basic concepts, consolidate the learning foundation.	Inspire students with national pride. To cultivate students to explore the scientific knowledge and devotion to science. For the great rejuvenation of the Chinese nation contribute their strength

	The most important thing is to stimulate students' interest in learning and make them familiar Know the mechanical properties of commonly used metal materials	
The basic knowledge of engineering materials	Metal crystal structure, defects, alloy phase structure; The crystallization of metal and alloy, the crystallization of binary alloy; Iron-carbon alloy phase diagram; Composition-structure-properties relationship of iron-carbon alloys. The teaching goal is to enable students to master the basic knowledge of crystal structure, crystallization, organization and properties of metal materials	Emphasis should be placed on cultivating students' philosophical thinking, improving students' awareness of production safety and quality, and improving students' ability to analyze and solve problems. The composition-organization-property relationship of iron-carbon alloy contains the view of the connection in materialist dialectics
The metal plastic deformation and crystal, heat treatment again	The microscopic mechanism of metal plastic deformation; The effect of plastic deformation and recrystallization on the microstructure and properties of metal; Heat treatment principle of steel; Heat treatment process of steel. The teaching goal is to master the basic principles and process characteristics of various main thermal processing methods	Cultivate students' professional quality and spirit of materials under different heat treatment performance and use safety, contains the spirit, professional ethics and social responsibility
metallic material	Characteristics and uses of industrial steel and cast iron; The method and meaning of the grade and code of commonly used metal materials, non-ferrous metals and their alloys. The teaching goal is to learn the characteristics, uses and grades of industrial steel and cast iron, and have the preliminary ability to select wool damage, parts processing methods and process analysis	Educate students to establish lofty ideals and political aspirations, and cultivate correct world outlook, outlook on life and values. The performance of different grades of steel and cast iron is different, and the use is not necessary, just as there are many kinds of talents, students are encouraged to play their own characteristics and advantages, and strive to become useful talents for the country and society
Non-metallic materials and composite materials	Commonly used ceramic materials, polymer materials and composite materials. The teaching goal is preliminary understanding related to the course of a new material, composite material and new technology, new material, new craft	Combined with the current situation of China's non-ferrous metal resources, technical level, environmental pressure and production capacity, it can introduce the new development concept of "innovation, coordination, green, open and sharing"

4.2.4 Sort out a set of teaching plans and courseware that highlight the ideological and political concepts of the course.

According to the revised teaching syllabus, the course teaching plan and teaching courseware incorporating ideological and political elements and materials are sorted

out, and the ideological and political elements are organically integrated with the teaching of professional courses, so that students can accept them easily.

4.2.5 Innovate classroom teaching methods and means, enrich classroom organization forms, and innovate teaching assessment methods.

Form a "student-oriented" teaching mode, that is, take introduction, learning objective, pre-test, participatory learning, post-test and summary as the process links, adopt online and offline mixed teaching mode to implement teaching, grasp the three links before, during and after class, follow the principle of initiative and goal orientation, and pay attention to the deep participation of students.

Innovative teaching assessment methods, course grade assessment methods: final exam 50%, class performance 10%, homework 10%, case analysis 20%, comprehensive experiment 10%.

Clarify the relationship between curriculum objectives and assessment forms (Table 3).

Table 3. The relationship between curriculum objectives and assessment forms

curriculum objectives	Assessment form and score ratio (%)					Score and grade ratio
	classroom performance	homework	case analysis	comprehensive experiment	final exam	
1	6	6	5	2	30	49
2	2	2	5	6	10	25
3	2	2	10	2	10	26
total	10	10	20	10	50	100

5 Conclusion

It is an important task to carry out curriculum ideological and political construction in professional classroom to comprehensively improve the quality of talent training. Drawing on the concept of engineering education certification, the curriculum ideological and political construction is effectively carried out in the classroom of "mechanical engineering materials and thermal processing" by digging deeply into the elements of moral education, diversifying classroom organization forms and innovating assessment methods. Through the above systematic teaching reform, students' learning enthusiasm and final assessment scores have been improved to a certain extent. Practice has proved that combining with the concept of engineering education certification, integrating ideological and political education into professional courses can improve the quality of personnel training and enhance the effectiveness of engineering education professional certification output. In the later teaching reform, the author will, based on the existing experience, think positively, and further exert the significant role of curriculum ideol-

ogy and politics in cultivating high-quality talents, strengthen students' ideals and beliefs, and transport high-quality talents with all-round development for socialist construction.

Acknowledgment

This work was financially supported by Mechanical engineering materials and thermal processing--University curriculum Ideological and political demonstration project (NXSZ20220216), Exploration and research on the construction of teaching resources of Mechanical Engineering Control Basis - Based on the construction of first-class major of mechanical engineering (bjg2023101), Digital design Basic Teaching and Research Office (nxy1jcxz-18) construction project, Machinery Manufacturing Technology -- the first-class course of Ningxia Hui Autonomous Region and The National first-class professional construction project - Mechanical engineering.

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