Exploration and Practice of Teaching Reform of Ideological and Political Education in "Engineering Materials Science" under the Background of Emerging Engineering Education

Xiaodong Lao*, Xiaodong Zhou
School of Mechanical and Electrical Engineering, ZhouKou Normal University, Zhoukou, China
**Corresponding Author*

Abstract: The emerging engineering education paradigm sets higher standards for the cultivation of engineering talents, with an emphasis on fostering students' innovative capabilities and adaptability to change. "Engineering Materials Science" serves as a core course in mechanical majors, playing a pivotal role in students' professional knowledge acquisition and career development. However, traditional teaching approaches, both in content and methods, struggle to meet the demands of talent cultivation in the new era. Therefore, integrating ideological and political elements into this course is of utmost necessity. This paper bolsters the construction of the teaching faculty to ensure adequate teaching resources for course - based ideological and political education. Relying on classroom and experimental teaching, it implements ideological and political education throughout the teaching process from multiple aspects, including teaching content, methods, models, and experiments. It excavates ideological and political elements and integrates them into teaching segments. Simultaneously, in accordance with the outcome - based education concept in engineering education, it conducts reverse design of the course teaching, seamlessly integrating ideological and political elements to achieve an organic unity of knowledge imparting, ability cultivation, and value orientation. This provides an effective path for cultivating outstanding talents with humanistic qualities, a sense of social responsibility, and innovative capabilities.

Keywords: Emerging Engineering Education; Engineering Materials Science; Course - based Ideological and Political Education; Outcome - based Education.

1. Introduction

The emerging engineering education sets higher requirements for the cultivation of engineering talents. It places emphasis on cultivating students' engineering innovation capabilities and adaptability to changes, and stresses the need to break away from the original framework and path - dependence. It aims to foster students' critical thinking, ability to solve non - standardized problems, interdisciplinary and systematic thinking, imagination, creativity, and initiative [1]. The ultimate goal is to cultivate outstanding talents with humanistic qualities, a sense of social responsibility, and innovative capabilities [2].

2. Content and Significance of "Engineering Materials Science" Course

"Engineering Materials Science" encompasses the basic theories, knowledge, and skills of materials science. It includes aspects such as crystallization and phase diagrams, plastic deformation and recrystallization, principles and processes of heat treatment, etc. The course aims to enable students to master the relationships among the composition, microstructure, properties, and applications of materials. This knowledge serves as a solid foundation for their subsequent study of specialized courses and future career development. For example, understanding the crystallization process helps students comprehend how materials form and the factors influencing their internal structures, while knowledge of phase diagrams allows them to predict the microstructure and properties of alloys under different conditions.

This course plays an irreplaceable role in cultivating students' scientific literacy and practical abilities. It equips students with the necessary knowledge and skills to analyze and solve problems related to materials in engineering applications. As technology and

society continue to develop, the field of materials science is constantly evolving, putting forward higher requirements for the ideological and political education in this course [3]. In engineering, numerous safety accidents have occurred due to unreasonable material design. For students who will soon enter the engineering industry after graduation, it is essential to have a rigorous work attitude and a solid craftsman spirit. Therefore, during the teaching of "Engineering Materials Science", teachers should focus on integrating ideological and political education elements, strengthening students' engineering ethics education, cultivating their meticulous craftsmanship spirit of a great power, and inspiring their patriotism and sense of mission to contribute to the country through science and technology.

3. Teaching Status Quo and Problems of Traditional "Engineering Materials Science" Teaching

Traditional teaching methods, both in content and approaches, struggle to meet the demands of talent cultivation in the new era. In professional courses, the focus is mainly on imparting basic professional theories and technical knowledge, while overlooking the integration of ideological and political elements such as patriotism and ideological and political education into the talent cultivation plan and curriculum system. This makes it difficult to meet the fundamental requirements of cultivating qualified socialist builders and successors [4]. At the same time, college students today attach greater importance to autonomy and interactivity in learning and are eager for diverse learning methods. Therefore, reforming the curriculum and exploring effective teaching models are of great practical significance and are also important measures to improve teaching quality and cultivate high - quality talents [5].

During the cultivation of traditional materials science and engineering professionals, it remains a challenge to integrate ideological and political education into the curriculum to achieve a subtle educational effect. Thus, it is necessary to continuously explore new ideological and political elements to make curriculum - based ideological and political education more relevant to students' actual situations and social needs. Moreover, by keeping an eye on industry trends and social hot - spot issues and promptly integrating the latest ideological and political content into teaching, the curriculum - based ideological and political education can always maintain a vivid sense of the times. Through the construction of curriculum - based ideological and political education, the core socialist values can take root in the hearts of young students, so as to meet the actual needs of cultivating high - quality socialist successors [6].

The core of curriculum - based ideological and political education is to comprehensively enhance the ability to cultivate talents. The focus lies in guiding and assisting students to establish correct worldviews, outlooks on life, and values during critical periods, centering on ideological and political content such as political identification, patriotism, cultural literacy, awareness of the Constitution and the rule of law, and moral cultivation [6].

4. Teaching Integration Practice of Ideological and Political Elements in "Engineering Materials Science"

4.1 Strengthening the Construction of Teaching Staff

Teachers are the organizers and guides of curriculum teaching and the primary responsible persons for achieving educational and teaching goals. The "education awareness" and "education ability" of teachers play a crucial role in the quality of curriculum - based ideological and political education construction. Therefore, the curriculum team places the construction of the teaching staff at the top priority and adopts various measures to cultivate teachers' "education awareness" and enhance their "education ability". The specific practices are as follows:

(1) Make full use of the teacher training opportunities provided by the school's teacher development center, and mobilize and encourage the teachers in the curriculum team to actively participate in training activities both on - campus and off - campus.

(2) Utilize the school's policies for enhancing teachers' capabilities to select and send course - teaching teachers to conduct research and participate in conferences on curriculum - based ideological and political education construction.

(3) Organize internal experience exchanges and seminars on curriculum - based ideological and political education construction within the

curriculum team. Each teacher who has participated in the training is required to report and exchange within the curriculum team, so as to achieve "all - staff education" in the curriculum team.

4.2 Implementing Ideological and Political Education throughout Teaching Relying on Classrooms and Experiments

Based on the construction of the "Engineering Materials Science" course, we explore the integration points and ways of ideological and political elements. Without good curriculum construction, the function of curriculum - based ideological and political education will become like water without a source and a tree without roots. Therefore, we must carry out the educational and teaching reform of curriculum - based ideological and political education in combination with the characteristics of the course and respecting the laws of curriculum construction, so that ideological and political education can be seamlessly integrated into curriculum teaching to achieve a "subtle" effect. Combining the nature and characteristics of the "Engineering Materials Science" course, the curriculum team deeply excavates the ideological and political elements of the course from five aspects: teaching content, teaching methods and means, teaching mode, course research methods, and assessment and evaluation. It explores the ways of integrating these elements and boldly attempts the educational and teaching reform practice of curriculum - based ideological and political education.

4.2.1 Integration of Ideological and Political Education Concepts and Course Content

The "Engineering Materials Science" course is closely integrated with actual engineering projects. By introducing engineering cases with ideological and political education into classroom teaching and seamlessly integrating the content of each ideological and political knowledge point into the knowledge points of the mechanics course, not only can professional knowledge be imparted, but also students' ideological and political education can be strengthened. The corresponding relationship between the course content of "Engineering Materials Science" and ideological and political elements is shown in Table 1.

The specific practices are as follows:

(1) Taking China's bronze ware and the Wentian Space Station as integration points to cultivate students' national pride and craftsman spirit.

For example, in the introduction part, the example of Simuwu Ding is cited. As early as the Xia Dynasty four thousand years ago, our ancestors were already able to smelt copper. By the Shang and Zhou dynasties, China's bronze smelting and casting technology had reached a very high level. Goujian's Sword of the King of Yue has a sharp edge that can cut through more than 20 layers of paper. After testing, the sword body and the edge are composed of bronzes with different compositions, which is the earliest gradient material. The bronze chime bells unearthed from the Zeng Houyi Tomb in the early Warring States period can produce two tones with one bell.

The explosions of the atomic bomb and the hydrogen bomb, and the launch of the Shenzhou spacecraft all demonstrate that China has made leapfrog development in the development, research, and application of materials. In 2023, the admission notice of the University of Science and Technology Beijing was made of self - developed 5G steel, which is as thin as a cicada's wing, as shiny as a mirror, as hard as iron, and as flexible as a pine. Thus, students' national pride and craftsman spirit can be cultivated.

(2) Taking the booming development of China's aerospace industry as an integration point to cultivate students' patriotism and a rigorous scientific spirit.

For example, in 2025, the material used to engrave the principal's message on the admission notice of Harbin Institute of Technology is the same as the core thermal protection material of the return capsule of the "Mengzhou" spacecraft and the Tianwen - 2 probe. It can withstand temperatures above 3000℃ and the extreme environment of re - entry at the second cosmic velocity, providing "armor" for manned lunar landings and planetary exploration. This material was developed by the Ultra - High Temperature Thermal Protection Composite Materials Team of the Institute of Composite Materials and Structures of the School of Astronautics, Harbin Institute of Technology, in collaboration with Beijing Spacecraft Manufacturing Co., Ltd.

(3) Taking some negative engineering cases of engineering accidents caused by improper or

insufficient consideration of material principle design as integration points to cultivate students' sense of responsibility and good professional qualities.

For example, a bolt in the fork - ear of a suspension cable on the Egongyan Railway Bridge of the Chongqing Metro Loop Line broke. Students are guided to analyze the factors considered in material design. Another example is the widely discussed issue of "the kitchen knife breaks when patting garlic, and the customer service does not recommend patting garlic and cucumbers". Students are guided to think divergently from aspects such as the fracture morphology, material composition, manufacturing process, and heat treatment errors, and explore the possible reasons for the breakage of the kitchen knife. Through these cases, students can deeply feel the great responsibility of engineering designers, and they should love their jobs and develop good professional qualities in their daily lives.

Table 1: Corresponding Relationship between the Main Content of "Engineering Materials Science" Course and Ideological and Political Elements in the Course

Chapter	Professional Content	Ideological and Political Materials	Ideological and Moral Education
Introduction	Research tasks and content of the course; Development history of engineering materials	Houmuwu Ding; Goujian's Sword of the King of Yue; Development of China's aerospace industry: Shenzhou spacecraft; 5G steel admission notice of the University of Science and Technology Beijing	The beauty of materials; Cultural confidence; National identity and pride; Patriotism; Spirit of scientific exploration
Material Properties	Mechanical properties of materials under static and dynamic loads respectively	The kitchen knife breaks when patting garlic; The sinking of the Titanic is directly related to the quality of the hull materials	A rigorous and realistic scientific attitude; A solid work style; A down - to - earth craftsman spirit
Crystallization of Metals and Binary Phase Diagrams	Crystallization of metals; Binary phase diagrams; Iron - carbon alloy phase diagrams	The "Ice Ribbon" of the Beijing Winter Olympics, carbon dioxide refrigeration technology; The documentary "The Flag" casts the Party emblem with 16 tons of molten steel to make the title; National Metallographic Skills Competition for College Students	Cultural confidence; National identity and pride; A rigorous work attitude; Spirit of scientific exploration; Engineering responsibility awareness and craftsman spirit
Plastic Deformation and Recrystallization of Metals	Influence of plastic deformation on mechanical properties; Recovery and recrystallization, differences between hot and cold processing	Pressure processing of key parts of thermal power generation units in China; Work hardening of excavator bucket teeth; Analyze why it is easier to bend an iron wire than to straighten it	National identity and pride; A rigorous work attitude; Engineering responsibility awareness and craftsman spirit
Heat Treatment of Steel	Definition and purpose of heat treatment; Types and applications of the "four heat treatments"	Goujian's Sword of the King of Yue is still sharp after two thousand years; The secret behind a sword's ability to cut iron like mud	Cultural confidence; National identity and pride; A rigorous work attitude; Engineering responsibility awareness and craftsman spirit

(4) Taking the connection between some basic concepts in "Engineering Materials Science" and students' growth and development as integration points to cultivate students' optimistic, upward - going, and self - improving spirit of pursuing their dreams.

For example, in the basic part of material mechanical properties, concepts such as strength, hardness, and fracture toughness are introduced. Connecting with the heavy industry of a great power behind the science fiction movie "The Wandering Earth 2", such as the steel cables in the space elevator, which are made of ultra - high - molecular - weight polyethylene fiber produced by Sinopec. With a diameter of 0.5mm, it is as thin as five strands of hair, but its strength is 18 times that of steel, and its load - bearing capacity reaches 35kg, which is equivalent to being able to lift the weight of a child and is used in the Hong Kong - Zhuhai - Macao Bridge. Another example is the walking

excavator produced by XCMG Group, also known as the "Steel Mantis", which can move "as easily as walking on flat ground" in complex terrains such as high - altitude areas, swamps, and forests through 56 movements. It also has strong adaptability to extreme temperatures and can operate at extreme temperatures of - 40℃ and 50℃. This can help students overcome difficulties, set lofty ideals, and cultivate their spirit of striving hard, remaining true to their original aspirations, and self - improving.

4.2.2 Integration of Ideological and Political Education Concepts with Teaching Methods and Means

The "Engineering Materials Science" course has a large amount of content and few class hours. During classroom teaching, teachers do not have large chunks of time to specifically explain ideological and political education content. Flexible and dispersed methods must be adopted to incorporate ideological and political elements into appropriate teaching links and teaching content. Teachers need to grasp the characteristics of the course and students, adhere to the student - centered and outcome - oriented educational concepts, focus on heuristic teaching. By asking questions, they guide students to think and analyze, and let students solve mechanical problems naturally while continuously inspiring them. At the same time, students' ideological and political qualities are improved, and the "dual - dominant" role of teaching is exerted, that is, the dominant role of students and the guiding role of teachers, to achieve the teaching goal of a "both interesting and effective" classroom. During teaching, it is necessary to comprehensively design the key points and strategic methods of teaching professional knowledge and ideological and political knowledge, intersperse the ideological and political knowledge points to be elaborated appropriately among the mechanical knowledge points, and carry out ideological and political education in a way that students love to see and hear.

In terms of teaching methods, centering on the educational and teaching concept of "student - centered", teachers often adopt heuristic and case - based teaching in class to cultivate students' independent thinking ability, the ability to solve complex engineering problems using mechanical knowledge, and good professional norms. For example, when teachers teach the mechanical properties of materials under static loads, first, they give examples and ask questions in combination with the stress - strain curve to stimulate students' thinking and exploration spirit, and let students understand concepts such as strength, hardness, and elastic modulus derived from the curve. When exploring these laws, specific problems should be analyzed specifically. When explaining the heat treatment of steel, the laws of phase transformation are discovered through the iron - carbon phase diagram, and different heat treatment processes are then introduced, allowing students to have a deeper experience of the combination of theory and practice.

In terms of teaching means, on the basis of the organic combination of multimedia and blackboard writing, the curriculum team has introduced the intelligent teaching tool "Xuexitong" for auxiliary teaching. Using these information - based teaching means, teachers can not only conduct efficient attendance in class but also interact and communicate with students anytime and anywhere, and even correct homework. They can timely master students' understanding of a certain knowledge point or some teaching content and obtain students' evaluations of the teaching and learning of the course in a timely manner, so as to timely improve or adjust teaching strategies to ensure the quality of teachers' "teaching" and the effectiveness of students' "learning". In addition, the introduction of intelligent teaching tools in the teaching of "Engineering Materials Science" can enable students to understand and experience the degree of in - depth integration of current information technology and higher education teaching, thus guiding students to cherish the current happy life, study hard, and be determined to serve the motherland.

In terms of textbook selection, new - form textbooks are adopted, which are rich in teaching resources. Teaching videos, animations, etc. related to teaching are supplemented through various forms such as QR codes and online classrooms. The textbooks also pay attention to the introduction of ideological and political elements.

4.2.3 Integration of Ideological and Political Education Concepts with Teaching Modes

(1) According to the characteristics of the teaching content, a new teaching mode, the PAD (Partitioned Classroom) mode, is introduced into the teaching of the "Engineering

Materials Science" course.

That is, part of the class time is used by the course - teaching teacher to explain the main content, key points, and difficulties of this class, and the other part of the time is left for students to conduct group - discussion - based and inquiry - based learning. The discussion topics of the group are generally provided by the teacher. For example, let students think and discuss in groups: The recrystallization temperature of tungsten is 1200℃. Is its deformation processing at 1000℃ hot processing or cold processing? The recrystallization temperature of tin is - 71℃. Is its deformation processing at room temperature hot processing or cold processing? In class, students communicate freely in groups, and the teacher gives on - the - spot guidance, randomly checks students' speeches, or asks each group to send representatives to take turns to speak to understand students' mastery of the teaching content. After the groups take turns to speak, the questions are further explored. Why is it easier to bend an iron wire than to straighten it, while solder is easy to break? In this way, students are given more opportunities to actively participate in course learning. On the one hand, it can exercise students' autonomous learning, independent thinking, and ability to analyze and solve problems. On the other hand, it can also improve students' communication and teamwork abilities through group discussions.

(2) The online - offline blended teaching mode is adopted.

With the development of the times, the Internet has become an important means for people to obtain information. Teachers' teaching methods should also keep pace with the times. In the teaching activities before, during, and after class, software platforms should be fully utilized to form progressive teaching of knowledge. The first step is carried out before class. Teachers push or self - make appropriate and appropriate amounts of teaching resources for "Engineering Materials Science" through the online platform, establish requirements and time limits for learning task points, and help students master basic knowledge before class. Through the practice and test links, students can conduct self - inspection and review of learning, and teachers can understand students' mastery. The second step is carried out during class. Teachers conduct intensive explanations of the main content of the "Engineering Materials Science" course in class and explain the weak knowledge points of students' learning according to the test results of the pre - class platform, so that students can break through the key and difficult knowledge points. In classroom activities, teachers can use software such as Xuexitong to carry out various activities such as selecting people, quick - answering, and theme discussions, which helps to improve students' classroom concentration and learning effects. The third step is carried out after class. Teachers use software to carry out live broadcasts, expand thinking knowledge, answer questions, and conduct after - class discussions, so that students can consolidate, improve, and expand their knowledge. The progressive teaching based on the software platform ensures the depth and breadth of students' learning content, ensures students' knowledge reserve, and improves students' self - learning ability and employment competitiveness. The home page of the online teaching platform of this course is shown in Figure 1.

Figure 1. Online Teaching Platform of "Engineering Materials Science"

4.2.4 Relying on Disciplinary Competitions to Improve Students' Professional Skills

The National Metallographic Skills Competition for College Students is a professional skills competition for undergraduates in ordinary colleges and universities across the country. Since its inception in 2012, it has been successfully held for fourteen sessions and has been included in the ranking list of subject competitions for college students in ordinary colleges and universities across the country. The holding of this competition is of great significance for mobilizing students' enthusiasm, cultivating

students' craftsman spirit, and improving the quality of experimental teaching. Through the competition of metallographic skills, students' relevant operation skills in metallography are improved, their professional knowledge of engineering materials is deepened, their practical hands - on ability is strengthened in the competition, and their confidence in practical exploration is also enhanced, laying a solid foundation for the cultivation of students' innovation and entrepreneurship abilities and teamwork.

Since 2021, our school has started to hold an internal metallographic competition to comprehensively improve students' hands - on ability, experimental skills, and teaching quality. Teachers explain the experimental process, operation details, safety precautions, and competition rules to students in detail. Subsequently, the laboratory is opened, and experimental equipment and consumables are provided. Students conduct independent experimental exercises under the guidance of teachers. Students are required to complete the entire sample - making process within a specified time, operate safely, and clean the experimental area to cultivate good experimental habits and a sense of social responsibility. So far, we have won 1 first prize, 1 second prize, and 18 third prizes in the National Collegiate Metallographic Skills Competition, and some of the award certificates are shown in Figure 2.

Figure 2. Award certificates of National Collegiate Metallographic Skills Competition

The implementation of the metallographic skills competition has led to great changes in the metallographic experimental teaching of "Engineering Materials Science". It has changed from the traditional teaching mode with teacher - centered indoctrination and students' passive acceptance to teacher - guided active learning by students; from students' theoretical knowledge learning to the combination of basic theory and practice; from classroom experiments to intense and lively skills competitions. It effectively promotes the cultivation of students' pioneering and innovative spirit and practical ability. The teaching team organizes students to analyze and discuss the samples and organizations specified in the competition in the form of flipped classrooms, fully mobilizing students' learning enthusiasm, and can achieve better learning effects than simple teacher lectures, achieving the purpose of promoting teaching, reform, and learning through competitions.

5. Thoughts on Promoting the Construction of Ideological and Political Education in "Engineering Materials Science"

Engineering education accreditation is an internationally recognized quality assurance system for engineering education and serves as the foundation for international mutual recognition of engineering education. The standards of engineering education professional accreditation cover seven aspects, namely students, training objectives, graduation requirements, continuous improvement, curriculum system, teaching staff, and support conditions, which are the basis for judging whether a major meets the accreditation requirements. The core of engineering education accreditation is to implement outcome - based education in engineering majors. Majors participating in the accreditation must arrange teaching activities in accordance with the graduation requirements. The graduation requirements that graduates of a major must meet, such as professional norms, the relationship between individuals and teams, communication skills, engineering and society, environment and sustainable development, research capabilities, and lifelong learning capabilities, are clearly defined. These graduation requirements correspond exactly to the values of dedication, integrity, friendship, harmony, and patriotism in the core socialist values, providing ready - made ideological and political elements for the construction of ideological and political education in the "Engineering Materials Science" course.

Therefore, the curriculum team has carried out reverse design of the teaching of the "Engineering Materials Science" course in accordance with the outcome - based education

concept in engineering education. It has reformed the teaching content, teaching methods and means, and teaching mode, and seamlessly integrated the above - mentioned ideological and political elements into each teaching link to achieve the trinity teaching goal of knowledge imparting, ability cultivation, and value orientation.

6. Conclusion

Under the background of emerging engineering education, the teaching reform of ideological and political education in the "Engineering Materials Science" course is of profound significance. It provides strong support for cultivating high - quality engineering talents with all - round development. In the reform practice, by strengthening the construction of the teaching faculty, teachers' "education awareness" and "education ability" have been significantly enhanced, laying a solid foundation for the construction of curriculum - based ideological and political education. In the teaching process, ideological and political elements have been deeply excavated and skillfully integrated from multiple aspects such as teaching content, methods, models, and experiments. This has stimulated students' learning interests, enhanced their ideological and political qualities, and increased students' enthusiasm and sense of identity for professional learning. While students master professional knowledge and skills, their ideological and moral qualities have also been well cultivated, and they are constantly developing in the direction of being both virtuous and talented.

Looking ahead, the construction of curriculum - based ideological and political education still needs to be continuously promoted. On the one hand, we should closely follow the engineering education accreditation standards, constantly improve the teaching content and methods, and make the integration of curriculum - based ideological and political education and professional education closer, so as to meet the needs of society and the development trends of the industry. On the other hand, we should continuously explore and innovate teaching models, excavate more ideological and political elements that conform to the times, and further enhance the effectiveness and appeal of curriculum - based ideological and political education. Through unremitting efforts, we aim to cultivate more outstanding engineering talents with both moral integrity and professional competence for the country, contribute to the realization of the strategic goal of a science and technology - powerful country, and promote the continuous progress of China's engineering field to new heights.

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References

[1] Chi GF, Wang J, Wang YJ, et al. Exploration and Practice of Teaching Reform of "Material Surface Engineering Technology" Course under the Background of Emerging Engineering Education [J]. Chemical Engineering Design Communications, 2025, 51(05): 52-54.

[2] Tian H, Liu DB, Qin WJ, et al. Practical Exploration of Integrating Traditional Culture Education into Project - based Learning from the Perspective of Emerging Engineering Education: Taking the Course "Frontiers of Engineering Materials and Their Forming" at Tianjin University of Technology as an Example [J]. China Education of Light Industry, 2024, 27(06): 70-76.

[3] Xiang HK, Lu SJ, Wang KW, et al. Exploration and Reflection on the Teaching of "Mechanical Engineering Materials and Heat Treatment" Course [J]. Neijiang Science & Technology, 2025, 46(04): 157-158.

[4] Qi ZB, Wei BB, Zhang Y, et al. Exploration and Practice of the Training Mode for Applied Materials Science and Engineering Professionals under the Background of Emerging Engineering Education [J]. Journal of Higher Education, 2025, 11(13): 161-164.

[5] Wu KX, Xia YW, Qin Q, et al. Exploration and Practice of the Curriculum Reform of "Engineering Materials and Applications" in Colleges and Universities [J]. Die &

Mould Manufacture, 2025, 25(06): 117-119.
[6] Wang QF, Dong BB, Guo YF, et al. Practical Exploration of Ideological and Political Education in the Course "Materials Research and Testing Methods" under the Background of Engineering Accreditation [J]. The Science Education Article Collects, 2025, (09): 114-117.

