

# Research on the Teaching Path of Curriculum Ideological and Political Integration of Materials Science and Engineering Introductory Course

Ming Song, Yan Xu, Wenchang Zhuang

School of Materials and Chemical Engineering, Xuzhou University of Technology, Xuzhou  
210000, China

## Abstract

**Introduction to Materials Science and Majors is a compulsory course for freshmen majoring in materials science and engineering in colleges and universities, and it is also the first professional course for students. The ideological and political teaching and curriculum design based on this professional introduction course play an important role in cultivating high-level talents with lofty ideals and professional qualities in the field of material research and development and application. This paper starts from the core concepts and research status of the teaching path of the introductory course of materials science and engineering, and designs the course teaching path, which provides a new idea for the integration of curriculum ideology and politics into the introductory course of materials science and engineering.**

## Keywords

**Course Ideology and Politics; Materials Science and Engineering; Introduction to Majors.**

## 1. Introduction

First, the core concepts of the teaching path research of the introductory course of materials science and engineering should be determined. It is about the ideology and politics of the introductory course of materials science and engineering. General Secretary Xi Jinping emphasized at the National Conference on Ideological and Political Work in Colleges and Universities, "Ideological and political theory courses must be strengthened in the process of improvement, enhance the affinity and pertinence of ideological and political education, meet the needs and expectations of students' growth and development, and all other courses must be well maintained. A section of the canal, planting a good responsibility field, so that various courses and ideological and political theory courses go in the same direction, forming a synergistic effect." As one of the basic disciplines of engineering, the discipline of materials science and engineering involves multiple majors such as inorganic non-metallic materials, metal materials, polymer materials, and materials physics. It is a fusion of engineering and science. Its professional characteristics include strong scientific, professional, practical and innovative characteristics. Among them, the course "Introduction to Materials Science and Engineering" is a compulsory course for freshmen majoring in materials science and engineering in colleges and universities. It is a basic course designed to allow students to systematically understand the professional curriculum system. Meanwhile, students will have an overall understanding of the subject, and cultivate their professional interests at the same time. The course is conducive to promoting students' understanding of the development process of majors, social significance, knowledge system and main courses of the major, so as to cultivate students' patriotism, social responsibility, and professional honor. It is helpful to cultivate senior students with lofty ideals and professional qualities in the field of material research and development and application. The introductory course of materials science and

engineering based on "course ideology and politics" is an inherent requirement for the integration of ideological and political theory into the early professional curriculum education for freshmen, and it is also the value appeal of higher education teaching reform and innovation in the new era.

Materials majors are faced with many problems in the ideological and political teaching work of courses. Only by clarifying the problems can we think about the solution. First, it is more difficult for college students majoring in materials to identify with the dominant values. Because of its more innovative and scientific nature, the major has more international and domestic exchanges. It is affected by the rapid changes in Chinese society and the penetration of Western values. In addition, college students are active in thinking, innovative and enterprising, dare to question and are easy to accept new things. Its values are more susceptible to changes in various social environments. Teachers of science and engineering majors generally lack humanistic quality. At present, most teachers of material majors are from their own majors, and there are gaps in teachers' humanistic quality to varying degrees. On the one hand, under the influence of the market economy system, the social morality and values are increasingly diversified, which makes some teachers weak in humanistic spirit, professionalism, and responsibility. On the other hand, some teachers have a single knowledge structure due to the excessive division of higher education majors in my country and the lack of penetration among various disciplines. Traditional research generally separates material courses from ideological and political courses, and believes that the focus of material course teaching is to master and apply technology, while the focus of humanities and social sciences teaching is to elucidate and promote morality. This is closely related to the characteristics of science and engineering majors. In the course setting of materials courses, the goal is to master the corresponding professional knowledge points, and it is more emphasized that students learn to use professional technical means to solve practical problems.

Based on the above problems, in view of the current situation of "students do not believe", "teachers do not know", and "professional knowledge is out of touch with ideology and politics", the author takes the course "Introduction to Materials Science and Engineering" as the entry point and expansion point to carry out ideological and political research. The research on teaching paths can provide new ideas for the ideological and political construction of materials majors and other science and engineering majors. From the four dimensions of "listening, watching, speaking and writing", the author establishes a four-in-one curriculum ideological and political system of "Introduction to Materials Science and Engineering". The characteristics of materials majors combined to explore the curriculum ideological and political construction path with multi-angle, multi-dimensional.

## **2. Research Status of Ideological and Political Teaching Path of Material Major Introductory Course**

First, as one of the three pillars of modern social development, materials are the material basis and technological leader of the development of science and technology. Our country attaches great importance to the cultivation of talents in the field of materials. According to statistics, the number of graduates from ordinary colleges and universities specializing in materials science and engineering is more than 10,000 every year. Guaranteeing and improving the quality of personnel training in materials majors is the foundation, and curriculum ideology is an important educational measure to improve the quality of personnel training and to shape the national pillars with firm beliefs and lofty ideals. "Introduction to Materials Science and Engineering" is the first course for first-year students majoring in materials science and engineering. It involves a wide range of knowledge, and the ideological and political elements that can be integrated are diverse and rich. It is helpful to format the correct values, patriotism

and mission sense, and is a key link in guiding students to understand, love, and devote themselves to majors.

The ideological and political research on the introductory course of materials science and engineering is still relatively limited. Huang Xiao and other researchers have discussed the methods and approaches of ideological and political implementation of the course from the perspectives of system and organizational guarantee, teaching content design, and course assessment methods [1]. After the implementation of the course ideological and political teaching method, the effect of classroom teaching has been significantly improved, and students have a clearer understanding of the historical development, social division of labor, and professional quality of the material major, which has strengthened the spirit of dedication and perseverance. In addition, Wu Fang combed the ideological and political advantages of the introductory polymer major course and the combination of ideological and political elements in the course, and at the same time explored suitable teaching methods or teaching models, so that they can go in the same direction as the ideological and political theory course [2]. Based on the major of new energy materials and devices, researchers such as Sun Hongyang and Xu Xiaodan took lithium-air batteries and potassium-ion batteries as examples, and took the realistic and innovative and scientific spirit of scientists as ideological and political elements, so that students can understand the need to be down-to-earth in the process of materials research [3-4]. In addition, for the bilingual teaching of introductory materials courses, Wang Rongrong of Guizhou University for Nationalities tried to realize the goal of all-round and whole-process education of materials majors by exploring the ideological and political elements of the courses [5]. Researchers such as Liu Lianying from Beijing University of Chemical Technology have excavated specific ideological and political content for the course chapters, and have achieved good course ideological and political practice results [6]. However, from the above-mentioned status and comparison of the same research field in the province and China, it can be found that the research on the ideological and political construction of the introductory courses of science and engineering, especially the introductory courses of materials science and engineering is very scarce. Some studies only put forward the entry point of curriculum ideology and politics from some perspectives. The method of curriculum ideology and politics is basically still in the process of classroom teaching, and it is difficult to form a better curriculum ideological and political effect. The four-dimensional professional introductory course construction proposed by the author of this article, "listening, watching, speaking, and writing", covers a wide range of areas, a wide range of participation, high feasibility, and strong practicability.

### **3. Design of Teaching Path for Introductory Course in Materials Science and Engineering**

Based on "Introduction to Materials Science and Engineering", which is the earliest professional course for freshmen, course ideology and politics is integrated into the teaching path research of the introductory course of materials science and engineering. The four dimensions of "listening, watching, speaking, and writing" establish a four-in-one curriculum ideological and political system of "Introduction to Materials Science and Engineering", and explore a multi-angle, multi-dimensional, multi-level organically unified curriculum ideological and political construction path. This course has been built into a dual-function course that combines professional knowledge and ideological and political education. At the same time, relying on this ideological and political construction course, it provides construction ideas for the ideological and political construction of other professional courses, thereby enhancing the patriotic awareness and humanistic quality of science and engineering students. Specifically, the research ultimately includes and achieves the following three goals: first goal is the

knowledge goal. Understanding the status and role of materials in the development of human society, especially the role of materials development in my country in promoting the development of world history. Mastering the organic unity among the four elements of material science, namely properties, structure, preparation and processing, and performance applications, especially understanding the correlation between the community of shared future for mankind and the above unity. Understanding the social role of various functional materials such as catalytic materials, battery materials, and nanomaterials, especially the growth experience and enthusiasm of my country's top patriotic scientists in various fields. Deeply understand "realize the Chinese dream of the great rejuvenation of the Chinese nation". Understanding the development trend of new material technology in the world, the development trend of the world's frontier science and technology fields, and especially the strategic deployment and international challenges in the field of materials in our country. Deeply grasp the "big changes in the world unseen in a century". Second goal is the Skill target. Understanding the research methods of materials, cultivating students' ability to use the theoretical knowledge they have learned to solve practical engineering and technical problems, especially understanding the relevant cases of using professional and technical capabilities to win the battle against poverty. Deeply experiencing the phrase "let the common people live a good life" meaning. Through reading materials, they have the ability to grasp the development trend of new material technology in the world, especially in the face of future challenges to understand that "the hope of the country lies in the youth, and the future of the nation lies in the youth". Understanding the operation process of material enterprises based on the relationship between organizational management, technical management, cost management and environmental protection, especially understand the truth that "lucid waters and lush mountains are invaluable assets". The third goal is the quality goal. Possessing the qualities of research, discussion, and speculation, especially the ability to combine the personal experience of returnee doctoral teachers to strengthen the "four self-confidences". Possessing the basic professional quality and logical thinking of engineering in materials engineering scientific research, especially in the future study and work, "do not forget the original intention and keep the mission in mind".

Focusing on the above goals, the author obtains an effective teaching path for integrating "course ideology and politics" into the introduction of materials science and engineering from the following four aspects. First, how to "Listen". The course "Introduction to Materials Science and Engineering" is not only a course of ideological and political construction, but also a core course to guide freshmen to understand the overall overview of the major as soon as possible. The first point is how to make students "listen". Specifically, it is necessary to study how to improve teachers' personal humanistic quality, patriotic and ideological teaching ability, so that students can "understand". How to combine students' hobbies, international topics of daily concern, and their own personal feelings, so that students can "listen in" is of importance. The second point is how to make students "watch". The course "Introduction to Materials Science and Engineering" is a professional course involving the latest development of cutting-edge science at home and abroad. It is also a practical course that requires combining theory with practice. How to make students "watch" this course is another important point. Specifically, it is necessary to study how to teach students to consult the latest academic literature and scientific and technological achievements, and to distinguish various Internet voices, so that students can "see thoroughly". How to enhance the feelings towards the city and the country by visiting important enterprises in Xuzhou such as XCMG, Xukuang Group and VV Group, so that students can "see the real thing". The third point is how to make students "talk". The course of "Introduction to Materials Science and Engineering" is an easy-to-interact and reversible course. Course teaching, especially ideological and political teaching, cannot rely on only one teacher to "talk", let alone "always talk" by teachers. How to make students "talk" is also

important. The last point is how to make students "write". Introductory courses such as "Introduction to Materials Science and Engineering" are generally assessed in the form of examinations and essays. What to write and how to write essays are very important. Basically, how to make students "write" this course well is the last content of the teaching path research. Centering on the design goals and processes based on the above teaching paths, the specific ideas are as follows: first, clearing the goal. It is from the four dimensions of "listening, watching, speaking, and writing" to establish a four-in-one curriculum ideological and political system of "Introduction to Materials Science and Engineering". Exploring a multi-angle, multi-dimensional, multi-level organically unified curriculum ideological and political construction path, making this course a dual-function course that combines professional knowledge and ideological and political education. While imparting inter-professional knowledge to students, help them establish correct values, patriotism and dedication to the country. Second, improving the teaching content. According to the teaching objectives and research content, based on the four dimensions of "listening, watching, speaking, and writing", improving the teaching content and methods, and systematically building the ideological and political system of the "Introduction to Materials Science and Engineering" course are important. Third, feedbacking on teaching effectiveness. Finally, evaluating the effectiveness of ideological and political education based on student feedback, teacher feedback, school feedback, and further optimizing the ideological and political system of the above courses. The specific method is as follows: on the basis of the existing curriculum construction and the above construction ideas, this project will be carried out in three steps from the revision of the syllabus, including updating and improving the teaching content and means, and the evaluating the effectiveness of the teaching reform. The first step is to revise the syllabus and establish the curriculum goals of the "trinity" of knowledge imparting, ability training, and value shaping. Combined with the course content, clarify the knowledge integration points, teaching methods and carrier channels of ideological and political education, and build a four-in-one course ideological and political system of "listening, watching, speaking, and writing". During and after the course is launched, based on student feedback, the teaching effectiveness of moral education penetration is carefully evaluated, and the organic integration of ideological and political education and knowledge learning is emphasized. The second step is to update and improve the teaching content and methods. In the chapter introducing the introduction, on the original basis, the development of China's materials field will further promote the development of the world. On the premise of ensuring objectivity and authenticity, highlighting Chinese scholars Research results and academic contributions in this field. In the chapter of "Four Elements" of the material, the concept of a community with a shared future for mankind is added to understand the unity of the above-mentioned "Four Elements" and the commonality of the community with a shared future. In the chapter of functional materials, the growth experience and enthusiasm for serving the country are added to the top patriotic scientists in various fields in my country, and the idea of "Chinese dream" is integrated. In the chapters of new development trends and strategic deployment in the field of materials at home and abroad, it integrates the strategic deployment and international challenges in the field of materials in my country, and deeply grasps the "big changes in the world unseen in a century". In the chapter on material engineering management, the concept of global material manufacturing and management integration is added, and Chinese discourses such as the "Belt and Road" initiative are introduced, which are not conducive to the unilateralism, trade protectionism, and Cold War mentality pursued by some Western countries. The concept and practice of global integration are compared to demonstrate China's responsibility and wisdom in promoting human cultural exchanges and social progress. The third step is to evaluate the moral education effect of curriculum reform. In the process of carrying out the program, pay attention to creating typical cases of ideological and political education, record and save them in various ways such as video,

pictures, and text, and invite experts to peer review and evaluation, and combine the review opinions to improve the teaching process. During the course and after the course, carefully listen to the feedback and suggestions of the lecturers, and learn about the ideological and political education effect of the course in detail through interviews, questionnaires, reading reports, etc.

#### 4. Summary

The teaching path of curriculum ideological and political integration of materials science and engineering introductory course is proposed in this paper based on summarizing the research status of ideological and political teaching path of material major introductory course. A multi-angle, multi-dimensional, multi-level organically unified curriculum ideological and political construction path is designed with four dimensions of "listening, watching, speaking, and writing".

#### Acknowledgments

This work was financially supported by the Educational Science Research Course Ideological and Political Special Project of Xuzhou University of Technology (YGJ-KC-2031) and Educational Science Research Project of Xuzhou University of Technology (YGJ2012, YGJ2159).

#### References

- [1] Xiao Huang, Miaomiao Wu, Guohua Li. Discussion on the ideological and political teaching methods of the introductory course of materials major in colleges and universities. *Science and Technology Vision*, Vol. 7 (2020), p. 33-34.
- [2] Fang Wu. The exploration of teaching reform in introduction of polymer materials and engineering major under the background of curriculum ideology and politics. *Guangdong Chemical Industry*, Vol. 47 (2020) No. 16, p. 243-244.
- [3] Xiaodan Xu, Jianwen Zhou, Hongyang Sun, et al. Curriculum-based ideological and political education in "Introduction to New Energy Materials and Devices": taking "Lithium-air battery" as an example. *The Science Education Article Collects*, Vol. 4 (2021) No. 520, p. 95-97.
- [4] Hongyang Sun, Zhenpin Qiu, Qinguang Zeng, et al. Ideological and political exploration of "Introduction to new energy materials and devices": taking "Potassium ion battery" as an example. *The Guide of Science & Education*, Vol. 35 (2021), p. 162-163.
- [5] Rongrong Wang, Qian Zheng, Gengyun Luo, et al. Exploration of ideological and political construction of science and engineering courses in colleges and universities: taking bilingual teaching of material introduction as an example. *Modern Vocational Education*, Vol. 20 (2020), p. 14-15.
- [6] Lianying Liu, Yunhua Yu, Jianping Deng, et al. Exploration of ideological and political construction of science and engineering courses in colleges and universities: taking bilingual teaching of material introduction as an example. *Education Teaching Forum*, Vol. 48 (2020), p. 78-80.