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Ideological and Political Design of the Course " Electromagnetic Field Fundamentals"

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Abstract

Carrying out ideological and political work throughout the whole process of education is an important measure to achieve all-round education for all staff and the whole process. This article discusses the ideology and political design of the course "electromagnetic field fundamentals" from three aspects: the significance, integration design and teaching methods of the course ideology and politics. The implementation of ideological and political courses is important to guide students to understand historical materialism and dialectical materialism in a subtle way, cultivate their patriotism, professionalism, craftsmanship, and scientific spirit. The ultimate goal is to promote the all-round development of students.

Keywords

Electromagnetic field; Ideological and political; Education; Integration; Teaching method.

1. Introduction

Promoting the ideological and political construction of curriculum is an important measurement to implement the speech of General Secretary Xi Jinping at the National Conference on Ideological and Political Work in colleges and universities. He stressed that the foundation of higher education lied in moral education and other courses should keep a good channel and cultivate responsibility fields, so that all kinds of courses and ideological and political theory courses go in the same direction to form a synergistic effect[1-2]. Thus, the construction of curriculum politics is the only way to unify moral education and intellectual education, and realize the full process of all-round education.

"Electromagnetic field fundamentals", which is an important professional basic course in the major of electrical engineering, is the foundation of the following professional courses such as electromechanics, power system analysis and high voltage technology. At the same time, it is also the growth point of some interdisciplinary and the foundation of emerging frontier disciplines[3-4]. The content involved in this course is an essential part of the knowledge structure that qualified undergraduates majoring in electrical engineering should have, which can enhance students' adaptability and creativity.

According to the development of electromagnetic discipline, the course mainly includes the physical basis of electromagnetic field, electrostatic field, constant electric field, constant magnetic field, time-varying electromagnetic field, quasi-static electromagnetic field, plane electromagnetic wave, uniform transmission line, etc[5]. In addition, the course contains a wealth of ideological and political education materials. Through the ideological and political construction of the curriculum, the rich elements of moral education are integrated into the teaching of professional courses. Then it can realize the ideological and political education and moral education function of professional courses. It not only enables students to master the basic electromagnetic laws. At the same time, it can cultivate students' dialectical materialism

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world outlook, scientific quality and scientific thinking methods, stimulate students' innovative consciousness and spirit, and help them to enhance patriotism and establish a dialectical materialist world outlook[6].

2. Ideological and Political Design of The Course "Electromagnetic Field Fundamentals"

2.1. General Design of the Course

The course centers on cultivating people with morality, and integrates ideological and political work throughout the whole process of education, so as to realize the whole process of education and all-round education, and makes students talent with great personality. Students are required to systematically master the basic principles and knowledge of the course, and be able to solve electromagnetic field problems with the help of mathematical tools such as advanced mathematics and vector analysis. It is also necessary to cultivate students' creative thinking ability such as constructing electromagnetic models and proposing electromagnetic hypotheses, and gradually improve students' innovative awareness and practical ability. In addition, it is important to guide students to understand historical materialism and dialectical materialism in a subtle way, cultivate their patriotism, professionalism, craftsmanship, and scientific spirit, and promote students' comprehensive, healthy and coordinated development.

2.2. Integration Design of Ideological and Political Content and Teaching Content

“Electromagnetic field fundamentals” has a complete structure, complex content and contains rich ideological and political education materials. The course mainly includes the physical basis of electromagnetic field, electrostatic field, constant electric field, constant magnetic field, time-varying electromagnetic field, quasi-static electromagnetic field, plane electromagnetic wave, uniform transmission line, etc. Therefore, this paper takes students as the center and teaching as the carrier in the course design, organically integrates electromagnetic professional knowledge and related ideological and political elements, and develops their intellectual and moral education from simple to difficult, step by step and silently. The integration design of each unit is shown in Table 1.

3. Teaching Method Design of Course Ideology and Politics

3.1. Introducing Moral Education to Develop Students' Dialectical Thinking Ability Attractively

The electromagnetic field is based on the study of electric field and magnetic field to explore the correlation between the two and the inherent law. The content itself reflects historical materialism and dialectics ideology. The proposal, verification and promotion of a series of laws such as Coulomb's law, Ampere's law of force, and the uniqueness theorem all embody the rigorous logical reasoning ability, highly abstract generalization ability, careful and meticulous work style and scientific spirit of excellence of generations of physicists. Therefore, in the process of teaching, when encountering such problems, materialist dialectics, scientific literacy, contradiction theory, connection and other contents can be introduced vividly to develop students' dialectical thinking ability.

For example, electromagnetic field is a kind of matter, but it is invisible, which reflects the objective reality principle of matter and exists independently of our senses. The wave-particle duality of light reflects that everything contains two aspects, reflecting the contradiction is the unity of opposites. Just as the acidity and alkalinity of material elements, there is no absolute acidic material or absolute alkaline material. Guide students to look at the problem dialectically,

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learn to regard the problem as a whole, find its inner connection and contradiction, and solve the problem. Although the discovery of the magnetic effect of electric current is accidental, it is devoted to Oster's research process for many years, which not only reflects the philosophical thought of contingency and necessity, but also further reveals that things are universally connected. This discovery was inspired by the unified philosophy of Kant and others about the mutual transformation of various natural forces and the universal natural force in the universe. Philosophy promoted the development of natural science.

Table 1. Integration design of ideological and political education

Teaching Module	Integration Points	Contents	Significance
Physical Basis	History of electromagnetics	Introducingthe Spirit of innovation and craftsmanship of scientists	Cultivate students' craftsmanship, excellence, patriotism, and innovation;Cultivate students ' scientific spirit of not superstitious authority, dare to question and challenge tradition
Electrostatic Field	Mirror image method	Significance of mirror image method in solving complex problems	Understand the methodology of simplification in dialectical materialism;Seize the essence of things when dealing with complex problems
Constant Electric Field	Ohm ' s Law and Joule ' s Differential Form	Relation between circuit and electromagnetic field	Connection is the objective nature of all things. The task of science is to reveal the inherent connection between things or phenomena.
Constant Magnetic Field	Development of magnetism	Introduce the achievements and contributions of magnetism in China	Cultivate students ' cultural confidence and patriotic feelings; Enhance students ' national pride and national confidence.
Time-varying Electromagnetic Field	Formation of electromagnetic waves	Relationship between time - varying electric field and magnetic field	Expounds the dialectical unity of things and universal contact point of view; Develope students ' scientific thinking ability
Quasi-steady State Electromagnetic Field	Eddy effect	Positive and negative application of eddy current effect	Everything has two sides; Learn to look at the problem dialectically
Plane Electromagnetic Wave	5G	Development of 5G technology in China	Cultivate students ' patriotism; Encourage students to dedicate to science
Uniform Transmission Line	Transmission line	High voltage transmission technology in China	Foster students' national pride;Stimulate students to return to the motherland with professional skills

3.2. Cultivating Students ' Scientific Attitudes and Spirits in Special Ways

According to the research contents of electric field and magnetic field, the electromagnetic field foundation is divided into eight units. In each unit, a topic can be selected and integrated into the moral education content by means of lectures, videos, etc., so as to systematically cultivate students' scientific attitude and scientific spirit.

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For example, with the discovery of Coulomb law as the theme, Coulomb's law is the first basic law in electromagnetism. Its discovery contains the establishment of general physical laws. That is, observing phenomena, asking questions, guessing results, designing experiments and measuring, and obtaining the main relationship of the law, the definition of new physical quantities, the determination of the content of the law, the giving of quantitative formulas, the establishment conditions, the scope of application, etc. This process has objective laws such as opposition and unity, quantitative and qualitative changes, negation of negation, opposition and unity of contradictions, dialectical unity of subjective initiative and objective laws. It can bring students a vivid experience, inspire them to realize the importance of being good at finding, analyzing and solving problems, and cultivate them to develop a rigorous and realistic scientific attitude and scientific spirit.

3.3. Cultivating Students ' Patriotism and Enhancing National Confidence by Case Study

China has made great contributions in the field of magnetism. The discussion of natural magnet originated in the Spring-Autumn Warring States Period. The declination of the geomagnetic field proposed by Shen Kuo in the Song Dynasty was more than 400 years earlier than that of the West. A large number of major scientific and technological innovation achievements such as Tianyan, Jiaolong, 5G technology, etc. can be introduced into the ideological and political classroom to stimulate students' national pride, inspire students' patriotic feelings, and enhance national confidence. These innovation achievements cannot be separated from the contributions of generations of Chinese scientists.

The new generation of scientists Nan Rendong, Huang Danian, Xu Qinnan and others have inherited the excellent qualities of the older generation of scientists who have worked hard for the motherland and the people, and have continued to advance in the breadth and depth of science and technology. They study hard, serve the country faithfully, make selfless dedication, overcome difficulties, and devote their whole life to winning glory for the country and the nation. Comrade Xi Jinping pointed out : “Among the core socialist values, the deepest, most fundamental and most eternal is patriotism.” By learning the patriotic spirit of scientists, the spirit of devotion to work, solidarity and cooperation in the course, we can fully stimulate students' national pride in a subtle way, guide students to establish a sense of home and country, enhance patriotic feelings, and turn patriotic feelings into reality action.

3.4. Stimulating Students' Innovative Consciousness and Spirit By Elemental Combination

The formulation and inference of the basic theory of electromagnetic fields is an innovative process from scratch, which condenses the wisdom of generations of scientists. They are not only proficient in electromagnetic theory, but also have great attainments in mathematics, physics, chemistry, philosophy and even art. With profound cultural heritage and professional integration, there has been an elemental compound effect of A+B to C, which has enabled them to achieve great academic achievements.

Faraday is diligent and studious, working hard, never giving up any opportunity to study. The basic knowledges of physics, chemistry, astronomy, geology, meteorology, etc. he has mastered has laid a good foundation for future research work. He introduced the concepts of electric field and magnetic field, proposed Faraday's law of electromagnetic induction, and discovered the magneto-optical effect, which laid the foundation for the unified theory of electricity, magnetism and light. Therefore, we carefully design the teaching content, dig out the stories behind the laws of electromagnetism, and guide students to master the professional knowledge. At the same time, we should explore extensively, increase cultural accomplishment, pay attention to the integration of different disciplines, and lay a good foundation for future work.

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We guide students to understand problems from practice, and learn to use philosophical ideas such as dialectics and contradiction theory to clarify the essence behind phenomena. More importantly, students should learn to break the inherent thinking and stimulate their own sense of innovation and innovative spirit.

4. Conclusion

In the ideological and political teaching of the electromagnetic field course, this paper mainly focuses on the four educational contents : dialectical materialism philosophy, socialist core values, scientific literacy and innovation. The results show that it can lead students to establish correct world outlook, outlook on life and values, and realize the resonance of knowledge teaching and values education.

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