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Exploration of Ideological and Political Education in the Course of Fundamentals of Programming for Electromechanical Majors

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Abstract: Under the background of vigorously promoting the development of Ideological and political courses in China, aiming at the characteristics of interdisciplinary integration of electromechanical majors, emphasizing the cultivation of ability to solve practical engineering problems, and the trend of intelligent, networked and modular professional development, this paper organically integrates the three elements of scientific thinking method training, scientific ethics and engineering ethics into the classroom as the focus of Ideological and political courses in the foundation course of computer programming, so that students can have good scientific thinking, scientific ethics and professional cultivation while having the ability of program development, and lay a good foundation for their future career. After three years of teaching practice, this method has achieved good results.

1. Introduction

Electromechanical majors cover many interdisciplinary fields such as machinery, electricity, electronics and automation, mainly including mechanical engineering, electrical engineering, mechatronics, automation and other directions. Although mechanical and electrical majors have different names, they all have the following common characteristics:

(1) Interdisciplinary integration. All mechanical and electrical specialties involve a high degree of cross integration of "mechanical+Electrical+control system", forming a complete technical ecology. Mechanical and electrical engineering, as a typical representative, integrates multi-disciplinary knowledge systems such as mechanical technology, electronic technology and automatic control technology.

(2) Adopting the dual track training mode of "theory+practice". These majors pay attention to the combination of theory and practice, strengthen the design, maintenance and processing ability of electromechanical equipments through practical training, and cultivate the ability to solve practical engineering problems.

(3) Technology development has the characteristics of intelligence, networking, modularization, systematization, miniaturization and greening.

Fundamentals of programming is a public compulsory course for electromechanical majors. There have been a lot of practice and research in China to carry out ideological and political education in programming courses and electromechanical courses.

Literature proposed the implementation scheme of Ideological and political education based on artificial intelligence technology, and elaborated on the teaching practice of optimizing the ideological and political objectives of the curriculum, reshaping the ideological and political content of the curriculum, innovating the teaching implementation of the curriculum, improving the curriculum evaluation system and strengthening teachers' Ideological and political literacy [1].

Literature combs the ideological and political teaching content of automation courses from the aspects of teaching objectives, teaching content and ideological and political elements, and puts forward practical schemes [2].

Literature explores the ideological and political elements of mechanical and electrical professional courses from the teaching objectives, teaching design, teaching methods, teaching evaluation and other aspects, adopts discussion, case, project and other teaching methods, and uses the network platform to share ideological and political resources, which realizes the combination of education and talent cultivation, and achieves good teaching results [3].

Literature describes how to take the teaching content of C language programming course as the carrier, establish the concept of Ideological and political education with morality and talent cultivation as the core, and how to deeply explore the ideological and political elements in each teaching unit, so as to achieve the dual goals of morality and talent cultivation [4].

In the process of reconstructing the teaching objectives, teaching contents, teaching methods and teaching evaluation of C language programming course, literature integrated four kinds of Ideological and political theme elements of serving the country with science and technology, innovation consciousness, craftsman spirit and engineering ethics in an all-round and whole process, forming a curriculum ideological and political education system driven by learning tasks [5].

Literature expounds the mining methods of Ideological and political elements from multiple dimensions and perspectives, such as professional characteristics and inspirational models, students' professional quality cultivation, Chinese excellent traditional culture, current political news and hot events, daily life around us, and discusses how to innovate teaching methods and integrate ideological and political objectives into teaching [6].

Literature proposes to take classroom teaching and various practice and training links as the starting point, carry out unified design and layout of various curriculum links, and do a good job in top-level design. The ideological and political education of basic disciplines and professional courses will be "moistened silently" integrated into the teaching links of mechanical design and manufacturing and automation major. Professional teaching and ideological and political education will form a synergy effect in the same direction and achieve "three complete education" [7].

The school of Mechatronic Engineering and automation of our university has a long history of running a school. Its comprehensive strength ranks among the best in the school, and it has a complete theoretical and practical teaching system. The college has five undergraduate majors: Mechanical Engineering and automation, electrical engineering and automation, mechatronic engineering, automation, and vehicle engineering. In the three academic years of 2022-2023, 2023-2024 and 2024-2025, the author has offered the course of "Fundamentals of program design" for students majoring in mechanical and electronic engineering, mechanical design and manufacturing and automation, and automation (hereinafter referred to as Electromechanical Specialty). With the rapid development of artificial intelligence and its deep application in the mechanical and electrical industry, students majoring in mechanical and electrical engineering have a strong interest in the

learning of programming courses, high learning initiative, and good semester comprehensive evaluation results. In the teaching process, while paying attention to the clear explanation of the teaching content, combined with the characteristics of mechanical and electrical majors, the author organically integrates the training of scientific thinking methods, the education of scientific ethics and engineering ethics into the classroom as the focus of the course, so that students can have good scientific thinking, engineering ethics and professional cultivation while having the ability of program development, and lay a good foundation for their future career.

2. Training of Scientific Thinking Methods in the Course of Fundamentals of Programming for Electromechanical Majors

As a basic course for electromechanical majors, the program design course can cultivate students' scientific thinking methods through a variety of ways in teaching, which runs through all aspects of course design, teaching content and practice.

2.1. Cultivation of Scientific Thinking in Curriculum Design

(1) Course orientation and objectives

The course aims to "master the basic thinking methods of solving problems with computers" and cultivate "the ability to solve practical problems with computers". The course helps students establish the logical framework of programming by understanding the thinking mode of computers.

(2) Teaching philosophy

It emphasizes the dual track training mode of "theory+practice", and strengthens empirical thinking through the cognitive path of "experiment theory re experiment". The course adopts the teaching method of "how to think like a computer scientist" to cultivate students' systematic thinking.

2.2. Scientific Thinking Training in Teaching Content

(1) Basic grammar teaching

Through the explanation of data type, operator and other concepts, cultivate classification and inductive thinking, such as understanding the storage and operation rules of different types of data. The teaching of variables and memory addresses introduces the abstract thinking model of computer system.

(2) Algorithm and programming

Through the "program flow chart, N-S flow chart" and other representation methods, the structured thinking and system analysis ability are trained. Case teaching, such as "four leaf rose number judgment", cultivates the algorithmic thinking of problem decomposition and step-by-step solution.

(3) Function and modular design

Function teaching emphasizes "splitting a complex program into modules" and cultivating dialectical thinking of analysis and synthesis. The course explains the relationship between the local and the overall situation through the parameter transfer mechanism, and trains students' systematic thinking.

2.3. Strengthening Scientific Thinking in Practice

(1) Programming practice design

Progressive exercises from simple to complex, such as basic operations to "aircraft war game

development", cultivate innovative thinking. Debugging training strengthens critical thinking and learns to reverse analyze problems through error information.

(2) Project practice

Comprehensive projects such as "simple neural network implementation" require interdisciplinary knowledge integration and cultivate innovative thinking. Team project development training system thinking and collaboration ability.

(3) Experimental method

The course experiments cultivate the positive spirit and rigorous attitude through strict data recording requirements. At the same time, the experiments also train logic comprehensiveness and boundary thinking through test case design.

Through the above multi-dimensional teaching design, the course not only teaches programming skills, but also systematically cultivates students' scientific thinking mode, laying a solid foundation for their subsequent professional learning and career development.

3. The practice of Scientific Ethics Education in Fundamentals of Programming for Electromechanical Majors

Scientific ethics education can be integrated into the teaching of programming course in a variety of ways to cultivate students' professional ethics and social responsibility.

3.1. Integration of Scientific Ethics in Curriculum Design

(1) Course orientation and objectives

The course emphasizes the preciseness of programming logic, cultivates students' pursuit of algorithm accuracy and repeatability, and embodies the spirit of seeking truth in scientific exploration.

(2) Teaching philosophy

The course emphasizes the "organic unity of knowledge transfer and value guidance", and combines scientific ethics education with programming skills training. In the teaching process, the "Course Ideological and political" mode is adopted to explore the ideological and political elements contained in the course, such as norms, integrity, critical thinking and other values.

3.2. Scientific Ethics Education in Teaching Content

(1) Programming standard teaching

The course emphasizes the standardization of code writing to cultivate students' working attitude of "being careful and meticulous". Students' rigorous scientific spirit is cultivated through detailed requirements such as variable naming and annotation specification.

(2) Intellectual property education

The course emphasizes the values of "integrity and justice", and it is prohibited to copy other people's codes in the experimental assignments. The course also cultivates students' awareness of respecting intellectual property rights by explaining open source protocols and copyright knowledge.

3.3. Strengthening Scientific Ethics in Practice

(1) Comprehensive experiment and assessment

The comprehensive experiment requires "independent completion, no copying", and the violator "will be punished if both parties fail". The assessment criteria include quality indicators such as "procedure writing habits and rigorous scientific attitude".

(2) Integrity requirements

Academic standard education is integrated into the practical teaching of the course, such as scientific research integrity requirements such as prohibiting falsification of test data and correct citation of algorithm sources.

3.4. The Deep Integration of Curriculum Ideological and Political Education and Scientific Ethics

(1) Innovative ethics education

The course encourages innovative thinking and emphasizes that innovation must comply with ethical norms. Cultivate students' awareness of "independent thinking and independent innovation" and have the ability of ethical judgment at the same time.

(2) Critical thinking education

Training students' critical thinking through the debugging process requires systematic verification rather than simple correction of abnormal results, which is in line with the falsification principle of scientific research.

Through the above multi-dimensional teaching design, the course not only teaches programming skills, but also systematically cultivates students' scientific and ethical awareness, laying a solid moral foundation for their career development.

4. The practice of Engineering Ethics Education in Fundamentals of Programming for Electromechanical Majors

Engineering ethics education can be integrated into the teaching of programming course in a variety of ways to cultivate students' professional ethics and social responsibility.

4.1. Integration of Engineering Ethics in Curriculum Design

(1) Course orientation and objectives

The course aims to cultivate students' professionalism of being careful, meticulous and teamwork. Through the teaching of programming, guide students to establish a scientific world outlook, outlook on life and values.

(2) Teaching philosophy

The course emphasizes the "organic unity of knowledge transfer and value guidance", and combines engineering ethics education with programming skills training. The course adopts the ideological and political model of the course, and excavates the ideological and political elements in the course, such as the values of safety, justice, team cooperation and so on.

4.2. Engineering Ethics Education in Teaching Content

(1) Information security

The course teaches the social impact of technical solutions through system security cases (such as buffer overflow vulnerabilities) and cultivates the awareness of "preventive ethics".

(2) Privacy protection

By explaining the importance of privacy protection, it is emphasized that "users' privacy should be respected when developing software". Through case teaching, such as data leakage, students are warned to protect personal information and data security.

4.3. Strengthening Engineering Ethics in Practice

(1) Team project development

The course defines the division of roles in team project practice, and emphasizes the main responsibility of engineers for project quality by simulating the responsibility attribution mechanism in the real project scenario. The course cultivates students' team spirit of "communication, cooperation, respect and trust" through group collaborative programming. In addition, the importance of code review is emphasized in the experiment to achieve the purpose of mutual supervision and common improvement of students' professional quality.

(2) Case analysis teaching

The course introduces real engineering ethics cases, such as the case of "a programmer did not delete the malicious program segment in the debugging code when he released the vulnerability detection tool in the open source community". At the same time, the course guides students to discuss ethical dilemmas such as "tripartite game of technical feasibility, commercial interests and public security".

4.4. Deep Integration of Curriculum Ideological and Political Education and Engineering Ethics

(1) Patriotism education

By telling the "history of the development of Computer Science in China", students' sense of national pride and patriotism are stimulated. The course combines the "current situation of industrial software in China" to cultivate students' sense of social responsibility and mission.

(2) Cultivation of craftsman spirit

Through debugging training and optimizing practice, the course cultivates students' craftsman spirit of excellence, and guides students' pursuit of excellence by emphasizing the spirit of "dedication, joy and diligence".

Through the above multi-dimensional teaching design, the course not only teaches programming skills, but also systematically cultivates students' engineering ethics consciousness, laying a solid moral foundation for their career development.

5. Effectiveness Evaluation

Table 1: Three year evaluation of teachers' teaching effect (from the perspective of students)

Evaluation Index	Score Rate of 2022-2023 Academic Year	Score Rate of 2023-2024 Academic Year	Score Rate of 2024-2025 Academic Year
Conscientious and Responsible	99.44	99.36	98.16
Love Students	97.84	98.72	96.96
Express Clearly	95.9	98.1	96.2
Outstanding Key and Difficult Points	96.48	96.8	95.04
Focus on Learning Methods and Ability Training	96.48	96.16	97.28
Stimulate Curiosity and Reap Great Benefits	94.6	95.8	95.8
General Impression	98.67	97.73	97
Learning Effect Eevaluation	92.7	89.7	90.1
Total Score	97.15	96.99	96.64

Because the teaching work is a continuous and all-round process, and the ideological and political education of the course is carried out by moistening things silently, simple preaching can not arouse the resonance of students, and the effect of the ideological and political education of the course can not be evaluated from the perspective of the ideological and political education of the course. Therefore, the overall evaluation of the course by students is a more appropriate way to implement the effect of Ideological and political education. Table 1 shows the students' evaluation of the course and teachers. It can be seen from the table that the students' evaluation of this course is relatively high, and the overall teaching effect is excellent, ranking in the forefront of similar courses.

6. Conclusions

According to the characteristics of electromechanical majors, this paper closely integrates the three ideological and political elements of scientific thinking training, scientific ethics and engineering ethics into the curriculum from the aspects of curriculum design, teaching content and practice in the fundamentals of programming, which has achieved good teaching effect and won the recognition of students. In the future, we will further tap the ideological and political resources of the course and improve the teaching methods to achieve better results.

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