Exploration and Practice of Ideological and Political Education: Taking Engineering Majors as an Example

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Abstract. In colleges and universities, the teaching of introductory courses of engineering majors generally has the objective problem of emphasizing theory rather than practice. Insufficient innovation and weak practicality cannot meet the requirements of engineering majors for students' practical and engineering abilities. To improve this problem, teachers must put the spirit of the National Education Conference into practice and promote the construction of ideological and political education in the curriculum comprehensively. This paper takes the electronic information engineering major as an example to explore the implementation path of teaching reform and ideological and political education in the curriculum. The romantic and political education in the curriculum is anchored explicitly in subject literacy, concept transmission, and emotional identity to give full play to the nurturing role of each course. Improve the quality of talent training in colleges and universities, and implement the fundamental task of establishing moral education.

Keywords: Teaching reform, talent training, curriculum education, ideological and political education

1 Introduction

College students still need to establish a good understanding and perception of their majors early after entering college. And this time is the learning stage of professional foundation courses, and the teaching of foundation courses in engineering majors generally focuses on theoretical education[1]. The main reasons for this problem are the following aspects[2-3]. One is that the main task of the foundation course, as the prior knowledge for the subsequent professional core courses, is to build a solid theoretical foundation to promote students' understanding of the knowledge system of the following core courses. Second, the experimental teaching of introductory courses is usually the experimental verification of fundamental theories and theorems, which causes the problem of insufficient innovation and weak practicality. The core scientific literacy of engineering majors is the comprehensive ability to solve engineering problems[4-5]. It is necessary to guide students at the introductory course stage in their first year of study to comprehensively shape university students' core scientific literacy and sincerely

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implement ideological and political education in the curriculum. The implementation has the following five aspects.

2 The Overall Structure

2.1 Application-Driven Scientific Value Shaping

A survey of professional understanding was conducted for first-year engineering students. The main content was to investigate the degree of first-year students' knowledge about their majors' courses and application areas, their understanding of the scientific value of their majors, and their academic planning for the four years of college[6]. The survey used an online questionnaire with ten questions publicly released and collected through Rain Classroom and social media platforms. The effective return rate of the questionnaire was 100%. The questionnaire was open to first-year students majoring in electronic information engineering and communication engineering. The percentage of male students participating in the questionnaire was about 58%, and the rate of female students was about 42%. By using computer technology to analyze questionnaire data, it can be found that S1 is highly negatively correlated with S2 and S9, as shown in Figure 1. It indicates that the fewer students who know about the scientific value of their majors in the early stage, the more likely they are to feel confused about their four-year study plan in college. And also more likely to experience study frustration. And S1 has a high positive correlation with S10 and S2 with S6, which indicates that the understanding of the scientific value of professional knowledge can promote a sense of identification with school and teachers, and students who have plans for their college career have a higher desire to explore and seek understanding. The survey data fully illustrates that the perception of the scientific value of professional knowledge is the core internal driver that affects subsequent study planning and the formation of engineering practice ability.

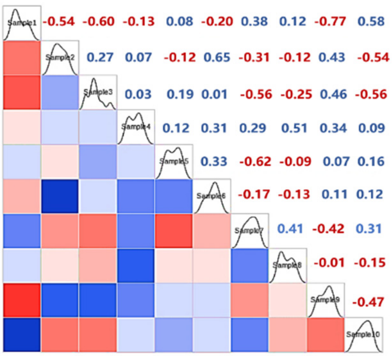

Fig. 1. Relevance analysis of the topic

Introducing industry application cases enhance students' sense of identification with the scientific value of their major. For example, teachers can start with the working principle of the pulse electrotherapy instrument circuit, guide students to learn the method of setting circuit parameters, learn the programming implementation of various algorithms, and explore the scientific value of electronic information engineering.

2.2 Idea Transfer of Knowledge Interconnection Structure

Students must be able to analyze and study complex engineering before graduation, so more is needed to acquire theoretical knowledge and exercise practical skills[7-8]. It is necessary to clearly understand the various specialized courses, experimental courses, and innovative, practical projects at the university. Building an interconnected network of knowledge between technical procedures within the discipline is required to use the expertise reasonably and adequately when encountering practical engineering problems.

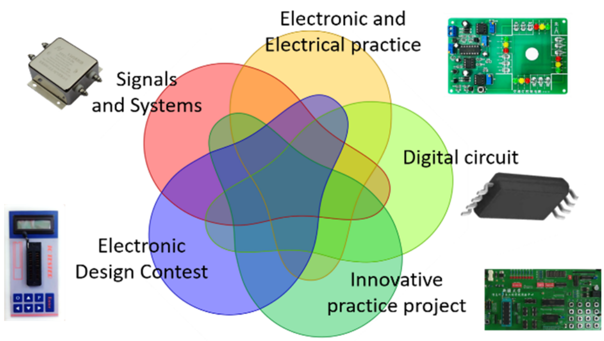

Fig. 2. Diagram of the correlation between courses

As shown in figure 2, the knowledge of integrated operational amplifiers is related to several other specialized courses in the Circuit and Electronics course, for example. First, it is associated with the Signal and System course, and the use of integrated operational amplifiers allows the design of filters in the Signal and System course. A signal generator can be designed and simulated using integrated operational amplifiers closely linked to the analog circuit design course. It is also related to electronic and electrical practice courses. You can use the working principle of an integrated operational amplifier to design an audio power amplifier. It can also solve the actual competition problem of the 2019 National Student Electronic Design Competition. The five courses mentioned above are closely related to the knowledge and application of integrated operational amplifiers. In addition, it is also possible to tie in classes such as digital image processing, microcontroller courses, and embedded systems with the help of other knowledge points. The circuits and electronics course is closely connected to other specialized techniques, laboratory classes, and innovative, practical projects through such expansion. These courses need to be studied subsequently, creating an interconnected network of knowledge that allows students to have macroscopic expertise and think about the information subject.

Computer technology can be used to design a circuit system that can comprehensively apply knowledge points from multiple courses on a virtual simulation experimental platform. Design high-quality product design solutions more accurately and quickly while reducing resource consumption.

2.3 Emotional Identification with Disciplinary Integration

The figure 3 shows that combining information science and agricultural science can create an information-based agricultural platform to realize smart agriculture[9-10]. By building a circuit of sensor networks, it is possible to remotely supervise crops grown mechanically over a large area. It enables scientific planting, cost-saving, and economic efficiency. Combining information science with building science can realize the information detection of building quality. By creating a microcontroller-based ultrasonic distance measurement system, it is possible to non-destructively test the ash cake inside the insulation layer of the building's exterior walls. It brings convenience to inspection while minimizing economic loss. An Android-based community service platform for older people can be established, thus integrating information science with a social life with the community-oriented service for older people. The three main elements of Web server design, software platform construction, and data interaction processing are used to strengthen the community's service approach to older people with modern information construction and further meet the needs of the elderly in life services. Combining information science and medicine can realize an AI-based prediction lung cancer system. It uses the currently publicly available exosome database as a data source. It processes it using deep learning methods to build a system model that can predict or diagnose lung cancer in advance. It can realize early prediction, early detection, and early treatment

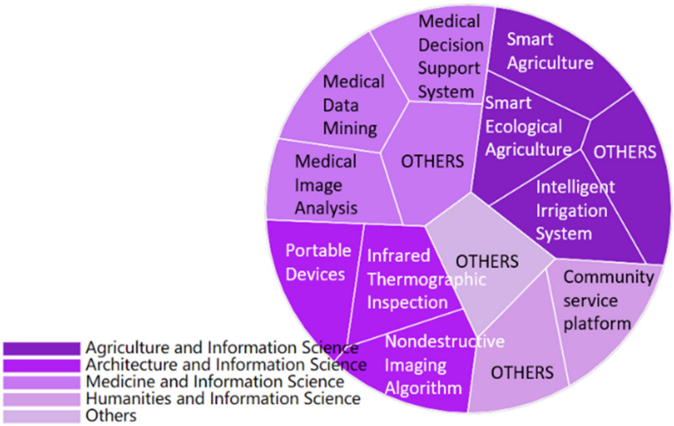

Fig. 3. Examples of disciplinary integration

The figure 3 shows some mature application areas of disciplinary integration between electronic information disciplines and other disciplines. By transferring the concept of disciplinary integration to students, they can spread their minds to explore more areas of disciplinary integration and stimulate their creative energy.

Comprehensive and in-depth implementation of ideological and political education in the curriculum can also take the integration of disciplines as a landing point, build a sustainable discipline system, break the barriers between traditional disciplines, and promote the cross-fertilization between basic and applied fields. Promote the intersection of arts and sciences, the intersection of science and engineering, the combination of agriculture and industry, the integration of medicine and industry, and other forms of the corner to cultivate composite high-level innovative talents to meet the needs of national social development. In the course of lectures, students' enthusiasm for learning the major is effectively stimulated, their love for the major and their emotional identification with the school and teachers are enhanced, and the ideological and political education of the course is further implemented.

2.4 Inspiration and Guidance of Innovation Trends

New engineering is a significant force to change the world, and the development of science and technology is a strategic choice for humanity to meet global challenges and achieve sustainable development. Therefore, constructing new engineering is a strategic choice for China to improve its competitive strength and a trend of innovation and growth. The new engineering construction is changing the teaching and learning behavior in colleges and universities, the talent cultivation program of colleges and universities, and the evaluation system and resource allocation of schools. It is also changing the life destiny of engineering students and the competition pattern of industries and reshaping the position of national competitiveness globally. By guiding students in the teaching process, they can fully understand the direction of new engineering construction and consciously enhance their sense of mission and responsibility, starting from the following six aspects as shown in figure 4.

Communicate the national guidelines and policies related to the construction of new engineering. The four years of college are the transition stage for college students to society. Understanding social hotspots and national policies will help them better understand their majors and plan their future development direction more clearly. Meanwhile, connecting majors with national policies can enhance the sense of mission and responsibility of these young people.

Fig. 4. Professional-related Innovation Trends

Combine the deeds of essential people in our country with the teaching content. Take the course on circuits and electronics as an example. When teaching the range of crystal diode, you can combine the deeds of our academician Wu Dexin[11]. She led her team to successfully develop a high-speed switching transistor for the first time, thus breaking the blockade of foreign technology. When teaching the content of operational amplifiers, you can explain it with the deeds of our academician Xu Juyan. He founded the first professional research institute for integrated circuits in China through the power of example to guide the way forward.

The construction of new engineering disciplines also promotes engineering education accreditation in colleges and universities. Engineering education plays an irreplaceable role in the continuous development of an independent and complete industrial system in national industrialization.

2.5 PDCA Closed-Loop Evaluation System

Evaluating the effectiveness of implementing ideological and political education within the curriculum requires developing a scientific and reasonable evaluation system. Continuous revision of the implementation process is necessary to achieve the implementation goals finally. The role of the systems in educating people is achieved by introducing the courses' ideological and political education content in four aspects: teaching objectives, teaching contents, teaching process, and teaching evaluation. Improve the quality of talent cultivation in colleges and universities, and implement the fundamental task of cultivating people with moral character[12].

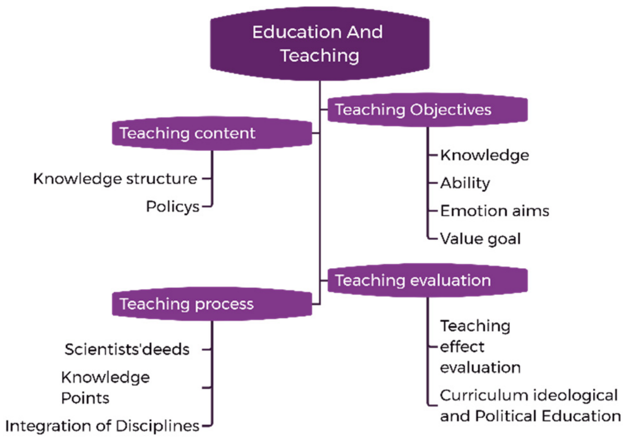

Fig. 5. PDCA-based teaching Implementation Process

Figure 5 shows the PDCA cycle in teaching and learning. Teaching objectives are the planning stage, planning the knowledge objectives, ability objectives, emotional objectives, and value objectives of education. Teaching content is the implementation stage, imparting knowledge and constructing a knowledge system. The teaching process is an inspection stage, that is, to check the mastery of knowledge points and the integration of disciplines[13]. The teaching evaluation is the processing stage, which uses scientific evaluation standards to identify the implementation, and plans the next round of implementation plan according to the processing results.

Completion evaluation must be closed-loop to continuously optimize iterations and thus achieve the desired teaching and learning outcomes. The PDCA is the four stages of planning, doing, checking, and acting. The PDCA closed-loop evaluation method is used to assess the implementation effect of ideological and political education in the course. The teaching model is gradually optimized to implement ideological and political education within the curriculum ultimately.

This assessment and evaluation model has many advantages:

1. It creates motivation.
2. It enables effective teaching.
3. It clarifies teaching objectives.
4. It achieves self-management.

3 Conclusions

Implementing ideological education within the curriculum through the above pathway has shown to be highly accepted by peers and students. The effectiveness of the course achieved is mainly reflected in three aspects: firstly, it promotes the professional construction of electronic information engineering. Feedback such as changes in students' expressions, speed of thinking, and accuracy in answering questions show that students' interest in learning has increased and the classroom atmosphere is good. The classroom interaction was orderly and effective, and the excellent classroom atmosphere added to my interest in learning this chapter. The overall learning effect was improved, objectively promoting professional courses' construction. Secondly, it achieves the expected goal of achieving the course objectives. It reflects the value objectives of the classroom teaching sessions, fully realizes the knowledge objectives, profoundly strengthens the ability objectives, and implements the ideological and political education objectives as expected. And thirdly, it enhances the students' innovation consciousness and innovation practice ability. The number of students participating in various subject competitions and innovative, practical activities has increased significantly, such as the National Student Electronic Design Competition, National Student Robotics Competition, National Student Intelligent Vehicle Competition, etc. The competition results have also improved by leaps and bounds. Students' innovation consciousness and engineering ability have been well exercised.

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