

Exploration of ideological and political education design in hands-on teaching of electronic technology courses

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Abstract. Hands-on teaching in electronic technology courses requires high experimental skills and equipment. The integration of ideological and political elements into practical classrooms requires careful consideration of methods and approaches. Proper introduction and permeation can achieve the organic integration and dialectical unity of explicit education in professional knowledge and implicit education in ideological and political development. Exploring ideological and political education methods in hands-on electronic technology courses can realize comprehensive and all-encompassing education in the field, fostering correct values and professional spirit, and enhancing students' overall quality.

Keywords: Curriculum Ideology and Politics; Electronic Technology; Hands-on Teaching.

1. Introduction

General Secretary emphasized, "We must adhere to the unity of explicit education and implicit education, explore ideological and political education resources embedded in other courses and teaching methods, and achieve all-round, all-process, and all-dimensional education for everyone" [1]. In June 2020, "the Ministry of Education issued the 'Guidelines for the Construction of Ideological and Political Education in Higher Education Courses,' providing an overall design and comprehensive deployment for the construction of ideological and political education in university courses" [2]. Exploring the ideological and political education design of hands-on teaching in electronic technology courses, considering the complexity and diversity of electronic circuit components, the inherent dispersion and nonlinearity of simulated electronic component characteristic parameters, the continuity, diversity, and complexity of the input-output relationships in simulated circuits, the corresponding logic level ranges in digital circuits due to different device characteristics, the non-ideal nature of testing instruments, and the matching between circuit units, all under certain conditions, may have a significant impact on the characteristics of the circuit. Therefore, this work presents certain difficulties and complexities. However, in the process of discovering and solving numerous experimental problems in electronic technology, it contains rich ideological and political education concepts and resources. If combined with current practical factors, it can demonstrate a subtle cultural influence in the classroom, allowing students to experience the philosophy embedded in specific cases and comprehend hidden truths in vivid practice.

As an outstanding educational integration method, curriculum ideological and political education enriches the types of educational forms, promotes the pace of education upgrading, and becomes a model for the integration of quality education and knowledge education, providing valuable references for innovative educational concepts. Research on ideological and political education methods in specific course categories is conducive to the promotion and development of curriculum ideological and political education. Therefore, the study of ideological and political education design in electronic technology teaching courses is of practical significance.

2. The Necessity of Ideological and Political Education in Practical Courses in Electronic Technology.

Curriculum ideological and political education encompasses morality, intelligence, physical education, aesthetics, and labor. Through the imparting of knowledge and the guidance of values, it not only cultivates professional knowledge and skills in individuals but also guides students in

establishing correct perspectives on life, the world, and values. Grounded in the fundamental principle of cultivating virtue and talents, with the core belief in ideal education, and the main focus on fostering and practicing the socialist core values, the key lies in establishing a comprehensive mechanism for all-round, all-process, and all-dimensional education. This aims to construct a clear, well-rounded, sound, scientifically operated, well-supported, and remarkably effective system for ideological and political work in universities.

In the developmental history of hands-on teaching in electronic technology courses, there has been a shift from a strong emphasis on theory to a focus on practical application. Continuously integrating practical application cases into actual teaching has enriched the content and honed the practical application skills of students. However, there are three specific reasons why it is imperative to incorporate ideological and political education into hands-on electronic technology courses.

(1) All courses serve an educational function, and all instructors have the responsibility of fostering personal development. Different courses play unique roles in talent cultivation programs, and courses in different majors have their own patterns and requirements for development. Implementing ideological and political education reforms in hands-on electronic technology courses is done with the premise of respecting the inherent development patterns of each course. This approach aims to uncover and highlight the value-guiding function while respecting the course's fundamental role in knowledge transfer and skill development. Having standardized approaches to ideological and political education in the classroom is conducive to shaping and nurturing students' worldviews, outlooks on life, and values.

(2) In hands-on electronic technology courses, a rigorous attitude, practical spirit, and strong operational skills are necessary for students to truly achieve experimental results, master operational skills, and eliminate safety hazards. Therefore, cultivating scientific thinking methods and adhering to correct operational standards are crucial.

(3) "The psychological crisis of college students is an extremely real and serious social issue, including the outbreak of psychological problems, long-term emotional accumulation, and stress responses to sudden events" [3]. In the classroom, it is often observed that some students are absent-minded, and their psychological factors are not being activated, or are even having a counterproductive effect. Psychological qualities, as a comprehensive psychological trait, not only determine an individual's psychological level but also restrict the formation and development of other abilities. Negative and positive psychology can lead individuals and situations to different outcomes in the same circumstances. It is essential to actively intervene and guide students during the learning process, helping them adjust their psychological states, cultivate resilience, and maintain a positive mindset. Integrating ideological and political elements into the classroom subtly can effectively improve negative psychological issues, stimulate students' learning motivation, achieve profound changes in the teaching operation mechanism, and avoid taking up valuable time outside of class.

3. Strategies for Ideological and Political Education in Practical Courses in Electronic Technology.

In the teaching of hands-on electronic technology courses, there is usually a brief introduction to the principles, and the majority of the time is devoted to guiding students to independently conduct experiments. For instructors, the conditions to spontaneously integrate ideological and political education within the class time are generally not available. To fully integrate the ideological and political education concepts and resources inherent in the course, and to play a role in nurturing students' ideological and moral values, it is essential to adopt appropriate methods.

As the renowned educator Ye Shengtao once said, "Teaching has principles, but there is no fixed method for teaching; what matters is finding the right method." The term "having principles" refers to the fact that teaching in different subjects follows certain patterns. The term "no fixed method" means that there is no universally applicable, fixed, and immutable method in specific teaching situations. Everything depends on the individuals and the context. Therefore, ultimately, it is about

"finding the right method." For hands-on electronic technology courses, a reasonable design can be achieved by incorporating ideological and political education elements seamlessly into various stages such as experiment preparation, principle explanation, experimental methods, group discussions, operational demonstrations, precautions, and summarizing experiences. This ensures that the integration of ideological and political elements does not appear abrupt and achieves a subtle and pervasive effect.

Taking the example of a single-stage common-emitter amplifier circuit experiment, the design can proceed as follows:

(1) Experiment Preparations:

Students are required to preview the experiment content before class, grasp the use of circuit simulation software to aid in experiment preparations, and use the simulation software to construct the experimental circuit, documenting their own experimental results. Students record the input and output waveforms of the single-stage common-emitter amplifier circuit, analyze the experimental process and conclusions, and may have some questions that lead them to consult books to verify their findings. This process effectively teaches students how to identify and solve problems, using simulation operations to guide deeper theoretical learning. For any questions not yet resolved, students will pay more attention to them in the classroom. This reflects the philosophy of "preparation ensures success; lack of preparation leads to failure," contributing to the cultivation of students' good study and life habits.

(2) Principle Explanation:

The single-stage common-emitter amplifier circuit experiment can achieve in-phase amplification from small current to large current and out-of-phase amplification from small voltage to large voltage. It guides students to grasp the concept of phase and deeply understand the relationship between the input and output of the circuit. The essence of amplification here is the amplification of energy. Where does the energy in the amplified waveform come from? This is a topic worthy of in-depth exploration. Energy does not appear out of thin air, nor does it disappear into nothingness. This inspires students to understand that energy comes from the power source, leading them to contemplate the conservation of energy and introducing the ideological point of "Energy conservation, also time conservation." Even if energy is dissipated as heat, it still has a clear origin and destination, and can even be transformed into light or heat. Similarly, reflecting on our daily time usage, how much have we gained, and are we clear about where our time has gone? Shouldn't we be accountable for our time? Encouraging students to cherish time, make efficient and planned arrangements for their time, and not squander precious moments.

(3) Experimental Methods:

The single-stage common-emitter amplifier circuit experiment can be conducted using a breadboard with discrete components. This approach allows students to understand the role and usage of each component clearly. In case of circuit malfunctions, troubleshooting will deepen the understanding of the specific functions of each component, leading to a profound comprehension of the entire circuit. This is a unit circuit and a small system. Inappropriate installation or wiring anywhere can cause errors in the overall circuit. Dialectically considering the relationship between the whole and its parts, the learning process emphasizes cultivating scientific thinking methods and establishing a systematic concept.

(4) Group Discussions:

Based on the characteristic curves of the transistor in common-emitter configuration, an analysis of amplification, saturation distortion, and cutoff distortion in the amplifier circuit is discussed. The working conditions of the transistor in the amplification region, saturation region, and cutoff region are analyzed. Simultaneously, clear understanding of the boundary conditions for these three operating regions is necessary, and students should know how to transition the working state of the single-stage common-emitter amplifier circuit. During the discussion, students will discover that changes in the numerical values of key parameters directly affect the working state, embodying the concept of "degree" — "a slight deviation leads to a great difference." "Quantitative change leads to

qualitative change." This inspires students to conduct experiments rigorously and meticulously, leaving no room for carelessness.

(5) Operational Demonstrations:

For experimental challenges, verbal explanations alone may not achieve a thorough effect. Using operational demonstrations allows students to visually observe experimental phenomena and data changes. However, to leave a lasting impression, instructors timely provide vivid analogies during the experimental operation. This approach can resonate with students and even if they forget the details of the experiment later, the instructor's descriptions can help them recall the specific circumstances. This kind of ideological content should be humorous and enlightening. For example, when choosing the type of transistor in a single-stage common-emitter amplifier circuit, one could say: "Transistors have two genders, one is PNP, and the other is NPN. They both share the common gene of a PN junction. Which one should we choose? We can't have a gender mix-up, right?" For students, this analogy is both memorable and unforgettable. Such humorous analogies have enlightening qualities, solidifying the differences between transistor types for students and using a point-to-surface memory approach. It is an intellectual means of inspiration, with intellectual education focusing on the acquisition of knowledge, skills, and logical reasoning abilities. Intellectual education is foundational to nurturing individuals.

(6) Summary of precautions and experiences

Summarizing experiences can help students connect isolated pieces of knowledge, forming a comprehensive knowledge structure. It involves a high-level abstraction of teaching content and a focused explanation of teaching strategies. A concise and easily memorable summary is essential, but dry and rigid terms may not leave a lasting impression. In such cases, using mind maps or other graphical representations for a brief overview can be effective. This not only clarifies key points but also aids memorization. Visually appealing charts are more likely to capture interest than plain text, contributing to aesthetic education, which cultivates a sense of beauty.

Curriculum ideological and political construction is a crucial measure to comprehensively enhance the quality of talent cultivation, covering moral, intellectual, physical, aesthetic, and labor aspects. It aims at the simultaneous development and integration of these five aspects. Practical courses in electronic technology should emphasize the comprehensive development of students' qualities. In the construction of ideological and political aspects in the curriculum, it relies on the implementation by instructors, testing their moral education awareness and ability. Building a team of instructors with self-awareness in moral education and strong moral education capabilities is essential for ensuring a coordinated and aligned talent development in these courses. To achieve this, universities should enhance instructor training through various measures such as training for newly appointed instructors, training for program directors or responsible professors, and special training on curriculum ideological and political education. This will effectively strengthen instructors' awareness of moral education, cultivate and enhance their moral education capabilities, and develop a conscious understanding of the research and strengthening of ideological and political education functions in course teaching.

4. Ideological and Political Education Evaluation for Practical Courses in Electronic Technology

The goal of curriculum ideological and political construction lies in "ideological and political" aspects. Without a well-functioning ideological and political education, course instruction may lose its soul, deviate from its direction, and result in a disconnection or even conflict between knowledge impartation, skill development, and value guidance in course teaching. The foundation of curriculum ideological and political construction is the course itself. Without a well-constructed course, the ideological and political functions of the curriculum become like water without a source or a tree without roots. The focus of curriculum ideological and political construction lies within departments and colleges. The reform of ideological and political education in courses requires a transformation

of educational concepts, optimization of teaching content, innovative teaching methods, and involvement across various courses and disciplines. Therefore, it brings new issues and challenges to the layout of higher education teaching reforms and the organization of teaching activities. It requires the establishment of an operational mechanism that ensures communication and participation at all levels. The effectiveness of curriculum ideological and political construction is reflected in students, as the fundamental purpose of all educational activities in schools is to cultivate high-quality talents.

Typically, course examinations are important means of evaluating the effectiveness of course teaching. In this process, by incorporating examination of specific knowledge and skills, creatively designing questions that include ideological and political elements can effectively assess the ideological and political teaching effectiveness of the curriculum. Additionally, the degree of student participation, the extent of teacher-student communication, the evaluation of teaching quality, and educational experiments of teaching methods are different perspectives for assessing the effectiveness of ideological and political education. Comparisons between pilot classes and regular classes can be used to verify the effectiveness of ideological and political education. In the management of the teaching process and quality evaluation, making value guidance an important monitoring point indicator involves strengthening it from the source, goals, and processes. This ensures that practical courses in electronic technology have moral education functions, and the philosophy is implemented through a series of teaching construction, operation, and management mechanisms. Specifically, in the approval of important teaching documents such as talent training programs and teaching outlines, the realization of the simultaneous enhancement of knowledge impartation, skill development, and value guidance should be considered. In the selection, approval, evaluation, and acceptance of quality courses and key courses, indicators related to value guidance or moral education functions should be set. The development of course evaluation standards should include observation points for the "moral education effects."

5. Conclusion

When conducting practical teaching in electronic technology, there is a need to emphasize the cultivation of practical skills in the traditional sense while cleverly incorporating ideological and political elements into the teaching process. The design should revolve around the core competencies of practical courses in electronic technology and implicitly embed correct values and essential character elements. The essence of ideological and political education should be naturally integrated into the course content to achieve the dual purpose of teaching and nurturing individuals.

The construction of ideological and political education in the curriculum is not a one-size-fits-all approach. It requires coordinated efforts at the department, faculty, and administrative levels, reinforcing top-level design and implementing precise strategies. In-depth collaboration among faculty members is essential, involving diligent research to delve into ideological and political elements. Continuous innovation in teaching methods and training approaches is crucial to elevating the level of moral education. Only through these efforts can ideological and political education be seamlessly integrated into the entire system of talent cultivation, ensuring that the transmission of values is rich in knowledge, and that course teaching embodies the essence of ideological and political education. This return to the original purpose of teaching—nurturing both talent and individuals—is the key.

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