Research on the Integration of Curriculum Ideology and Politics into the Experimental Teaching of Sound Velocity Measurement

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Abstract: Curriculum ideological and political education takes "cultivating morality and cultivating people" as the fundamental task of education. College physics experiment involve the history of physics, scientists' stories, craftsman spirit, etc., which can produce a good combination with ideological and political education. This paper takes the sound velocity measurement experiment as an example, adopts the case teaching mode, integrates the ideological and political elements of the course with the knowledge of ordinary physics experiment, and carries out experimental teaching by three-dimensional design of experimental classroom and comprehensive use of various teaching methods. The application of modern technology in experimental teaching, such as the use of mind mapping to draw the learning process of the experiment, the preparation of MATLAB programs, and the reference of virtual simulation experiments to assist teaching, helps students to voluntarily accept the course of ideological and political, so as to help students establish a correct outlook on life, values and world outlook.

1. Introduction

Course-based ideological and political education refers to the comprehensive, all-round and profound ideological and political education of college students in the higher education stage by means of course design, teaching content and ideological and political education of teachers.

Curriculum-based ideological and political education takes "moral education and talent cultivation" as the fundamental task of education, emphasizing the subtle and imperceptible influence. During the course learning process, by presenting a certain theory or idea, it is ultimately instilled at the level of the educated students[1-2].

The measurement of acoustic wave characteristics (frequency, wave velocity, wavelength, sound pressure attenuation, phase) is an important part of acoustic application technology. The sound velocity measurement experiment is a fundamental experiment in college physics experiments. It contains a considerable amount of content related to the history of the development of physics, stories of scientists, and the spirit of craftsmanship, and thus can be well combined with ideological and political elements. In the teaching of experimental courses, the case-based teaching mode can be adopted. Ideological and political education in the curriculum can be integrated into the experimental projects. By creating problem situations, students' problem awareness can be cultivated, their ability of independent thinking can be enlightened, and their interest in learning can be stimulated[3-4].

How to effectively integrate the content of "course-based ideological and political education" and "College Physics Experiment" courses, so that students truly love and are willing to accept the infiltration of values and truly achieve the purpose of teaching and educating people, is an urgent problem to be solved in the current teaching process.

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2. Integrate ideological and political elements into the teaching design of the experimental classroom

2.1 The meaning of ideological and political education in courses

In 2015, the General Office of the Central Committee of the Communist Party of China and The General Office of the State Council issued the "Opinions on Strengthening Ideological and Political Education for College Students", putting forward the requirement of "providing students with comprehensive, systematic and in-depth ideological and political education through ideological and political education in courses". The fundamental issue of talent cultivation is defined as: what kind of people to cultivate, how to cultivate them and for whom to cultivate them. To solve the problem of talent cultivation, it is fundamentally necessary to run education rooted in China and adhere to the socialist orientation of running schools [5].

2.2 The experimental content integrates ideological and political elements

We adopt the case-based teaching mode, integrate ideological and political elements of the curriculum into the physics experiment teaching process, and construct a closed-loop ideological and political system of the "learning - feedback" curriculum[6].

1) First of all, we adopt multiple links for ideological and political learning, and construct teaching tools and links such as teaching syllabuses, electronic courseware, experimental videos, and MOOC websites that contain ideological and political elements. As a common natural phenomenon, the speed of sound, how to better explain the knowledge points and extend them to applications in daily life can help deepen understanding.

2) Secondly, we organically integrate ideological and political content with the course content, running through the entire process from previewing before class, learning during class to reviewing after class. Before class, assign learning tasks. During class, demonstrate and show the experimental results on the spot. Answer students' questions about the experimental phenomena to deepen their understanding. In addition, drawing on the experience of science popularization bases, by introducing demonstration experiment content (visible sound waves, fish washing, and Quinte pipe), the generation mechanisms of sound wave patterns, standing waves, and resonance phenomena are explained to enhance students' interest in learning. After class, students are required to carefully complete the processing of experimental data, write experimental reports, consult literature, and have in-depth discussions on the experimental results and phenomena during the experiment.

3) Thirdly, we consider conducting positive feedback from multiple perspectives. The assessment and evaluation are conducted through forms such as organizing students to carry out experimental demonstrations, defenses, and defenses among students. Meanwhile, students are encouraged to innovate, and ideological and political education in courses is evaluated through various forms such as extracurricular science and technology projects, competition awards, and publication of papers.

2.3 Three-dimensional Design of the Experimental Classroom

A variety of teaching methods are comprehensively applied to design the experimental teaching classroom. Specific teaching needs are proposed for different experimental projects. The network platform + virtual simulation experiments are used to assist teaching. The enthusiasm and creativity of students' learning are fully activated in the experimental classroom to improve the teaching effect of the classroom [7].Table 1 shows how to determine the educational goals, explore ideological and political elements, and carry out classroom teaching reasonably for the existing sound velocity experiments.

In the experiment of sound velocity measurement, explore the methods of integrating ideological and political factors into classroom teaching. Taking the development history of sonar as an example, this paper expounds the country's scientific and technological research in this aspect and the development process of the 7,000-meter manned submersible "Jiaolong" - cultivating students' sense of responsibility and mission to explore the unknown, pursue the truth, and bravely scale the peaks of science.

Table 1 Overview of Teaching content, Objectives of Ideological and Political Education in the curriculum, and Teaching Methods

Overview of Teaching content	Course-based ideological and political education objectives	Teaching methods, and exploration of ideological and political elements
Sound velocity Experiment	1. Visually display the experimental phenomena and images, advocating the combination of learning and thinking as well as the unity of knowledge and action. 2. Cultivate college students' scientific attitude of being realistic, down-to-earth, meticulous and serious, and truly achieve the purpose of teaching and educating students. In the introduction of the history of ancient acoustics, emphasis is placed on cultivating students' sense of patriotism and national pride, exploring the research achievements of scientists.	1. In the introduction of the history of ancient acoustics, exploring the research achievements of scientists, experiencing the wisdom of our ancestors, and inspiring national confidence. 2. By demonstrating experiments with examples to introduce the standing wave phenomenon in "fish washing", it is vivid and interesting, which can increase the interest of students in learning the formation principle of standing waves. 3. In the popularization of sonar knowledge, the Jiaolong manned submersible independently developed by our country is introduced, with emphasis on cultivating students' idea of serving the country through science and technology.

2.4 Comprehensive Design of Experimental Evaluation

Starting from multiple dimensions, various evaluation models have been established to stimulate and cultivate students' pioneering and innovative spirit. Non-standardized and comprehensive evaluation has been strengthened, which is in line with the cultivation of innovative talents.

When evaluating experiments, emphasis is placed on a comprehensive assessment of all aspects of the experiment, such as students' understanding of the experiment during their regular operations, scientific style, and ability to analyze and solve problems. Students are encouraged to point out the shortcomings and deficiencies of existing experiments and propose improvement methods. We encourage students to be innovative and assess them through extracurricular science and technology projects, competition awards, and publication of papers.

3. Modern technology is applied to experimental teaching

3.1 Integrate mind mapping technology into experimental teaching

We use the method of mind mapping to systematically explore the connotation, extension, application, ideological and political elements and other contents of the experimental project. We describe knowledge resources and their carriers with visualization technology, mine, analyze, construct, draw and display knowledge and their interrelationships, and present the entire experiment in a graphical way[8-9].

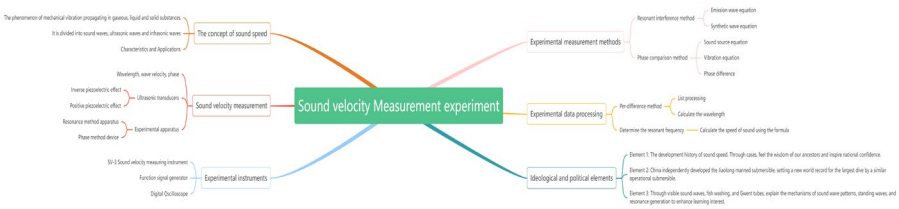

Figure 1 shows the experimental teaching process of mind mapping

Figure 1 shows a simple drawing of the ideological and political factors and experimental links involved in the teaching process of the sound velocity measurement experiment using the mind mapping method. This is convenient for students to preview before class and review after class. It can also be assigned as experimental homework to students to see what they have learned in this experiment. In addition, it can increase the extended application of the experiment.

3.2 Develop MATLAB programs to assist teaching

Taking the sound velocity experiment as an example, the GUI interface function of MATLAB can be applied to compile different programs for the resonance method and the phase method, which is convenient for students to understand the generation mechanism of the experiment, the experimental waveform, and the processing methods of the corresponding data .

In addition, virtual simulation experiments for sound velocity measurement are used to assist teaching, the original experimental data are recorded reasonably, and process supervision and inspection are strengthened.

4. Conclusion

The ideological and political materials for the college physics experiment course are rich and diverse, how to seize these convergence points and integrate them into the experiment teaching can effectively enhance the educational effect of the course teaching.

This paper adopts the case-based teaching mode, integrates ideological and political elements of the curriculum into the experimental teaching process of sound velocity measurement, explores the three-dimensional design of the experimental classroom, conducts a comprehensive design of the experimental evaluation, and investigates the introduction of several modern technologies (mind mapping technology, MATLAB GUI program, virtual simulation experiments) to assist the experimental teaching. This not only enriches the teaching content of the experimental classroom, It is more conducive to students voluntarily accepting ideological and political education in courses, thereby helping students establish correct outlooks on life, values and the world.

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