Reform and practice of ideological and political education in college physics course

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Abstract: The reform of curriculum ideological and political (IAP) is a research hotspot of the basic curriculum reform in China. As a compulsory public basic course for science and engineering majors in our university, College Physics has a unshirkable responsibility and natural educational advantages in cultivating students' scientific thinking, scientific methods, scientific spirit, scientific attitude, and scientific ethics. By improving the curriculum system, reforming the curriculum objectives, adopting the four-dimensional integrated teaching mode, and taking the selection of IAP elements and the intensive teaching of cases as the starting point, the college physics course carries out the reform and practice of IAP education. These reform measures have effectively played the IAP functions of college physics courses, and explored a new way of IAP education belonging to college physics courses.

1. Introduction

College physics is a public basic compulsory course for science and engineering majors in our university, which has strong theoretical and practical significance, has a wide audience, a strong foundation, and a rich knowledge system[1]. The basic concepts, theories and methods taught in the course are an important part of college students' scientific literacy. The history of physics, the background and conditions for the emergence of important physical ideas, and the interaction between the development of physics and the development of human society are important materials for cultivating students' scientific spirit and attitude. The engineering application of physical knowledge is an important support to cultivate students' sense of national pride and responsibility for the country. Therefore, the IAP reform of college physics courses is of great significance[2]. How to reform college physics teaching, how to better play its role in educating people has become a topic that every physics teacher has to practice and think deeply about[3]. This paper carries out the following IAP reform and practice in the teaching practice of college physics.

2. Course IAP Teaching Practice

2.1. Strengthen the concept of moral education, and determine the new goal of course teaching

College Physics has a strong theorization and practicality. The basic concepts, theories, and methods taught in the course are an important part of college students' scientific literacy. The history of physics, the background and conditions for the emergence of important physical ideas, and the impact of the development of physics on the progress of human society are important materials for cultivating students' scientific spirit and attitude[4]. The engineering application of physical knowledge is an important support to cultivate students' sense of national pride and responsibility for our country. Through sorting out the IAP elements of the course, the course's IAP training objectives have been condensed into two levels of "value guidance and scientific literacy training", and the course objectives have been upgraded from "knowledge, ability, and quality training" to "value guidance, knowledge teaching, ability improvement, and scientific literacy

training", as shown in Figure 1.

Figure 1 Course objectives

2.2. Persist in teaching and educating people, and carry out heuristic-guided teaching

Since 2017, the course team has taken establishing morality and cultivating people as the fundamental task, deeply explored the IAP materials of the curriculum, and carried out reform research on the teaching methods of IAP education of the course. In the teaching process, we should break the old teaching mode of "cramming", adopt scientific and reasonable teaching methods such as heuristic and guidance, and skillfully insert IAP elements into classroom teaching in the form that students like to see and hear through the four dimensions of "classroom knowledge explanation, online resource learning, after-school research, and offline training" (shown in Figure 2), so that the process of knowledge teaching, ability training, and IAP education can be smoothly and seamlessly connected, Realize the implementation of the IAP content of college physics courses, and realize the students' recognition of IAP education.

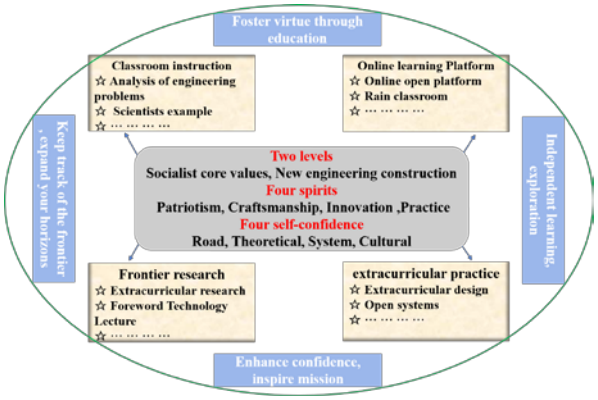

Figure 2 Cultivate students in four dimensions

2.3. Carry out self-reflection on course IAP education

In 2017, our college established a team to deeply study the IAP construction of college physics courses. First of all, it clarifies the fundamental educational issues of who, how, and for whom to cultivate people. The basic task of the course is to establish morality and cultivate people, and to integrate knowledge teaching, ability training, and value shaping. Second, build a high-level talent training system, focus on the IAP construction of the course, and solve the "two skin" problem of professional education and IAP education. Third, public basic courses should focus on strengthening students' ideals and beliefs, cultivating patriotism, strengthening moral cultivation, and improving students' comprehensive quality. Fourth, carry out the research and reform of the IAP teaching methods of the course to realize IAP education[5]. Fifth, carry out teaching training to improve teachers' ability in IAP education.

3. Course evaluation and effectiveness

3.1. Course evaluation method and mechanism

3.1.1. Diversified and process-based course assessment system

Diversified assessment forms: group paper (design) 3%, group defense 3%, classroom test 3%, classroom discussion 3%, homework 9%, half-term exam 3%, attendance 6%, final exam 70%.

Process assessment method, a combination of theory and practice, discussion and report, and combination of "value guidance and knowledge, ability and quality training". In the final examination paper, students' mastery of knowledge and scientific literacy is examined through the selection and judgment of basic physics knowledge, physical phenomena, knowledge application, etc. Through filling in the blanks and calculation questions, the student's ability to make qualitative analysis and quantitative calculation by using the laws of the physical theorem is investigated. Through the comprehensive questions and short answer questions of engineering application, the student's ability to integrate theory with practice, innovation ability and scientific literacy will be examined to achieve both knowledge and ability.

3.1.2. Evaluation mechanism for the achievement of curriculum objectives

College Physics has clear IAP goals. The team has established an output-oriented evaluation mechanism for the achievement of course goals, implemented the evaluation on schedule, and carried out continuous improvement of the course

3.1.3. Formative evaluation system

Take students as the center, track and evaluate the learning process of students, understand the learning situation, especially the IAP dynamics, obtain continuous feedback, and improve teaching.

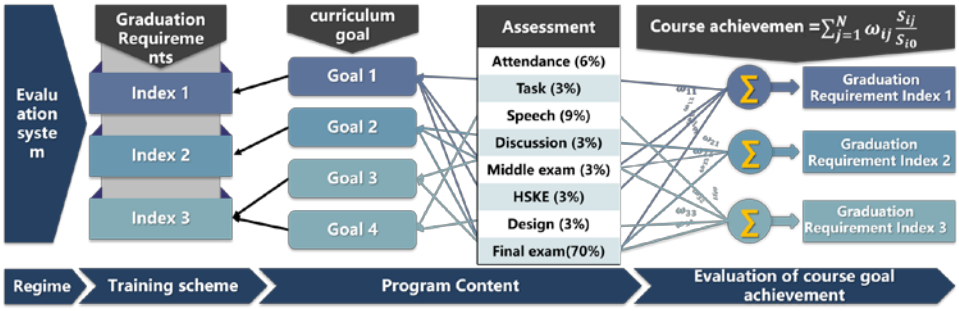

Figure 3 Achievement degree evaluation system

3.2. Reform achievements and demonstrations

Students' sense of gain has been improved, the questionnaire survey shows that the goal of IAP education has been achieved. 79% of the students believe that the deepest problems affecting them involve their outlook on life, values, and scientific spirit.

In the extracurricular design activities, students work in teams, actively think, persevere, dare to innovate, and design a series of innovative works.

Figure 4 Students' extracurricular design works

4. Conclusion

College Physics is a public compulsory basic curriculum for science and engineering majors in our university. It has an unshirkable responsibility and natural educational advantages in cultivating students' "scientific thinking, scientific methods, scientific spirit, scientific attitude, and scientific ethics". Improve the course content system by integrating the IAP content of the course, focus on highlighting the role of college physics course in the ideological value guidance, and upgrade the course goal from "knowledge, ability, quality training" to "value guidance, knowledge teaching, ability improvement, scientific literacy training". With the selection of IAP elements and the intensive teaching of cases as the starting point, IAP education of the course is imperceptibly carried out relying on the Physics textbook. Innovate the teaching mode, make virtue, cultivate people, and moisten things silently.

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