Construction and Reflection on Offline First-Class Course of College Physics

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Abstract: Based on the orientation of the Chengdu University of Information Technology, the College Physics course draws on the OBE education concept, continues to carry out teaching reform, constructs a diversified teaching system, innovates teaching mode, integrates curriculum ideology and politics, and implements multi-dimensional curriculum assessment, forming a curriculum goal of "knowledge imparting, ability cultivation, quality improvement, and value guidance", highlighting the educational advantages of the course, highlighting the educational advantages of the course, and cultivating high-quality application-oriented specialized talents with comprehensive development.

1. Introduction

The Chengdu University of Information Technology is a provincial-level local university dedicated to cultivating high-quality application-oriented specialized talents with healthy mental and physical health, good humanistic qualities, systematic theoretical knowledge, and solid practical abilities for the country, serving the local and industry sectors. As a core compulsory public basic course for all science and engineering students in the university, college physics courses plays an important role in cultivating students' knowledge, abilities, qualities, and values. There are three teaching problems in the college physics curriculum of our school. Firstly, students lack interest in learning. Students in our school generally have low self-requirements and low interest in learning physics courses[1]. Secondly, Students have low participation in learning and are passive learners. Due to a large number of students, small class discussion teaching is difficult to implement. Thirdly, the role of curriculum in educating people has not been fully realized. College Physics has natural advantages in cultivating students' scientific thinking, methods, and attitudes, but how to achieve valuable guidance for students in limited classrooms is a major challenge. To solve the above three problems, the university physics curriculum team has carried out a series of reforms and practices.

2. Reset Course Syllabus

2.1. Reset course objectives and implement the fundamental task of cultivating morality and talent

Based on the positioning of our school and the characteristics of the College Physics course, we have set the curriculum goal of "knowledge imparting, ability cultivation, quality improvement, and value guidance" .

Knowledge imparting. Students understand the basic knowledge of physics, master the ideas and methods of physics research problems, and have a certainly foundation in scientific and technological theory.

Ability cultivation. The goal of the course is to cultivate students' physical modeling ability, qualitative analysis and quantitative calculation ability, theory to practice ability, and cultivate

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logical thinking, critical thinking, innovative awareness, and innovative thinking.

Quality improvement. The curriculum goal is to help students establish a spirit of scientific thinking, pursuit of truth, research, firm scientific attitude, and rational thinking, cultivate students' ability to discover problems, analyze and solve problems.

Value guidance. The curriculum goal is to help students establish their ideals and beliefs, cultivate patriotism, cultivating students' spirit of scientists and innovation.

2.2. Update teaching concepts to make knowledge more lively

The teaching philosophy of the course is to enable students to learn vivid physics knowledge. The course provides a background for knowledge loading engineering and daily life applications, allowing students to learn dynamic physics knowledge, scientific ideas and methods through knowledge application, exercise their abilities, and improve their scientific literacy. The course adopts a "four layer progressive" teaching method of opening questions, fun applications, practical example explanations, and engineering problem analysis to explain the connotation of knowledge layer by layer, explaining the relationship between physics and engineering, demonstrate the applicability of physics knowledge, thereby enhancing students' interest in learning and deepening their understanding of physics ideas and theories[2].

2.3. Set up diverse teaching methods to keep students busy

The course adopts diverse teaching methods such as classroom discussions, group speeches, and extracurricular design to change students' passive listening state, increase student participation, and enhance learning challenges, stimulate students' active thinking and practice, make the classroom lively, and enhance students' sense of achievement and achievement in learning.

The course adopts diverse organizational methods such as heuristic, guided, and exploratory methods, to create students' active thinking of open and design exercises[3]. The course utilizes online video resources to deepen students' understanding of knowledge and expand their horizons[4]. The course application of rain classroom increases teacher-student interaction, strengthens classroom management, and improves learning efficiency and effectiveness.

2.4. Dig deeply into the curriculum ideological and political elements, and implement the responsibility of educating people

The course relies on the history of physics, physicists, major discoveries in physics, and important technologies to guide students to establish scientific thinking, scientific methods and attitudes, the correct three perspectives, and implement moral education and talent cultivation[5]. In teaching, we used China's leading technology applications to enhance students' national confidence and pride, used leading engineering cases from other countries in the world to inspire students' mission to serve the country through science and technology, and used the exemplary power and advanced spirit of scientists to inspire students to establish scientific concepts, and cultivate their scientific spirit. In teaching, we used open-ended exercises to help students understand the development process and cutting-edge achievements of physics, to cultivate innovative and practical spirits, etc..

3. Reform teaching mode and explore diversified assessment methods

3.1. Innovate teaching models and implement the student-centered concept

Focusing on the curriculum objectives, the basic idea of classroom teaching is "teacher led, student centered, and ability centered". Diversified knowledge transfer and teaching organization methods are adopted, supplemented by online resource expansion. Rain classroom is applied to optimize curriculum management, and construct a curriculum teaching model combining teaching and guidance, traditional and modern methods.

3.2. Implement a diversified assessment system to achieve comprehensive assessment

The course is guide by output and adopts a comprehensive and diversified assessment model,

emphasizing both knowledge and ability. Students enhance their sense of achievement in acquiring knowledge and improving their quality through diligent learning.

3.3. Utilize the rain classroom to enhance students' participation in learning

The course utilizes Rain Classroom to record students' self-learning (10%), classroom tests, and homework modules (60%) to assess students' self-learning situation before class. The course utilizes rain classroom to asses students' participation in classroom interaction, discussion, and understanding of knowledge points in classroom (10%). This course evaluates students' preview of knowledge through the "Preview homework " module of Rain Classroom (10%). In classroom, based on the students' classroom discussions, the teacher focuses on explaining the knowledge.

3.4. Assessing students' innovative abilities in the classroom

At the beginning of the course, students are divided into 10 technology groups to conduct research on open-ended exercises, extracurricular design, engineering problem analysis, etc.. At the end of the semester, products, research reports, or defense PPT (10%) are formed. This assessment assesses students' scientific action ability, independent literature review, problem discovery, research, paper writing, and language organization.

4. Building course resources

The course team teachers have integrated teaching concepts and ideological and political education into the teaching content, published a textbook, and compiled teaching materials such as PPT, engineering (science) problem analysis, and exercise answers. The course team teachers recorded a set of teaching supporting videos, including 77 videos in three modules, covering knowledge understanding, expanding horizons, and cutting-edge science, breaking through classroom limitations and making up for the shortcomings of offline teaching. The course team recorded 15 short videos on ideological and political education, covering multiple topics such as the history of physics, physicists, major scientific discoveries, and important applications of physics technology.

5. Course Features and Innovation

The course positioning has local characteristics. This course fully considers the objective needs of engineering students in local undergraduate colleges for physics knowledge, scientific ideas and methods, engineering abilities and literacy, and value guidance. It proposes a teaching concept of loading application backgrounds for physics knowledge and explores a model and method suitable for engineering physics education in local general undergraduate colleges.

The setting of course teaching content has new ideas. The curriculum education concept closely follows the new situation of higher education, the curriculum teaching objectives reflect the requirements of student cultivation in the new era, and the curriculum teaching design is close to the needs of students. Our curriculum strives to reflect the comprehensive cultivation of "knowledge, abilities, and qualities" rather than a single knowledge, and to reflect the comprehensive guidance of "physics, ideas, methods, and values" rather than a single physics teaching. Through the classroom, we aim to explain the significance of physics course learning to students.

The concept of curriculum construction has advanced awareness. By closely relying on the characteristics of university physics courses and taking the construction of the "Physics" textbook as the starting point, we will comprehensively integrate the content that reflects educational concepts, course objectives, teaching content, teaching methods, and digital teaching into the textbook compilation.

Promote the transformation of curriculum teaching concepts and methods through the construction and using of the textbook. A construction concept of college physics curriculum has been formed that integrates textbook construction, teaching reform, and curriculum characteristics.

6. Future construction plan of the course

Bench marking the construction of national first-class courses, combined with the requirements of local engineering colleges for university physics teaching, and based on the actual situation of our university's physics courses, we will focus on promoting the construction of course teaching informatization, characteristic teaching video resources, and teaching staff, highlighting the characteristics and advantages of course teaching, and continuing to improve the quality of university physics course education.

(1) With the goal of achieving teaching informatization, we will comprehensively carry out classroom teaching mode reform. Introducing information technology teaching platforms and national high-quality physics course resources in teaching reflects the modernization of course teaching.

(2) Focusing on students' learning needs, we will build some course featured video resources. On the basis of existing course features and resources, we will further develop online course video resources, course ideological and political short video resources, and fragmented knowledge point learning short video resources to meet the learning needs of students both online and offline, as well as in and out of class.

(3) To comprehensively enhance the teaching level of course teachers with the goal of continuous improvement in course teaching. According to the requirements of first-class courses, we will strengthen the teaching discussion and research of physics courses, improve the teaching evaluation mechanism, achieve full coverage of continuous improvement of teachers' teaching process, teaching effectiveness, and teaching quality, and strengthen the use of evaluation results.

7. Conclusion

Our school aims to create a first-class undergraduate course with the characteristics of our school, widely coverage, and broad benefits. The goal is to implement the fundamental task of cultivating moral character, reform teaching concepts, content, design, models, and assessments, and form a unique teaching system that reflects the gender equality concept. This course seizes the core elements of talent cultivation, takes the construction of first-class course as an opportunity to integrate information technology, integrate teaching resources, repeatedly practice and refine online and offline teaching, promote knowledge transfer, ability cultivation, quality improvement, and value guidance, and comprehensively improve the quality of talent cultivation.

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