

Reform on College Physics Experiment Course in the Context of Innovation Education

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Abstract: College physics experiment teaching can cultivate students' scientific thinking ability and innovative spirit. Under the background of "mass entrepreneurship and innovation", this paper puts forward the reform measures of university physics experiment teaching under the background of innovation education. To serve the reform of university physics experiment teaching under the background of innovative education. Specific measures include selecting and optimizing experimental projects, updating experimental teaching instruments; using modern educational technology to open remote experimental teaching; encouraging participation in academic competitions to stimulate students' awareness of innovation; developing flexible teaching models for different experimental levels; optimizing innovative education platforms; encouraging students to innovate enthusiasm.

1. Introduction

Innovative education is an education based on the cultivation of students' innovative spirit and innovative ability. The spirit of innovation is the spirit of courage to create new ideas and new things. The ability to innovate is the ability to continuously provide new ideas, new theories, new methods and new inventions with economic, social and ecological values in the fields of technology and various practical activities. The spirit of innovation is the subjective condition that affects the development of innovation ability, while the improvement of innovation ability is the rational support of the spirit of innovation. Innovative education is not only the education of creativity or the education of creating spirit, but is centered on promoting the subjectivity of students, promoting the development of students, fostering a sound personality, and focusing on cultivating development on the premise of doing basic learning. Learning and creative learning. The curriculum objectives of innovative education must reflect the perfect unity of knowledge, ability and personality. Educators must update their educational concepts, enhance their sense of innovation, reform their educational methods, stimulate their creative motives, and resolutely abandon the educational concepts of knowledge, lightness, inheritance, and light practice, and innovate students' knowledge structure, ability structure, and quality structure. Innovative talents with broad foundations, strong competitiveness and the courage to explore.

Physics is a basic science that reveals the objective laws of the occurrence and development of things and plays an important role in the cultivation of human scientific quality. College physics teaching is the basis for engineering students to learn professional knowledge and is also an important channel for cultivating applied technology talents. Experiment is the foundation of physics, reflecting the commonality and universality of science and engineering experiments, and plays an irreplaceable role in the cultivation of talent science quality. The new scientific and technological revolution represented by computer information science and technology and life science has accelerated the development of science and technology and the cross-infiltration between various disciplines. The new integration trend has become the mainstream of scientific development. Therefore, the teaching system, teaching content, teaching methods and teaching methods of the physics experiment course must be changed from packaged to open.

As the first experimental course for college students to enter colleges and universities, the

university physics experiment not only requires students to be trained in rigorous systematic experimental skills, masters the basic knowledge, methods and skills of scientific experiments, but more importantly, cultivates students' rigorous scientific thinking ability and Innovative spirit, cultivate students' ability to connect theory with practice, analyze problems and solve problems, especially the comprehensive ability to adapt to the development of science and technology, and adapt to the innovation ability of scientific and technological progress. In view of the problems existing in the teaching of university physics experiment, in the era of "mass entrepreneurship, innovation", in order to meet the needs of the era of teaching reform and innovation, this paper is based on a new perspective to lay a solid foundation for the cultivation of innovative spirit and innovative ability. Serving the reform of university physics experiment teaching under the background of innovative education.

2. Innovative Education System in Colleges and Universities

Colleges and universities shoulder the important task of cultivating high-quality talents and shoulder an important mission in building an innovative country. Under the background of innovative education, colleges and universities must vigorously promote education innovation, build an innovative education system, and actively explore new ways to cultivate innovative talents.

(1) Innovation in teaching concepts. The teaching concept is a concentrated expression of understanding. It is also the people's perception of the teaching activities and the basic attitudes and concepts held by them. It is the belief that people engage in teaching activities. The teaching concept has theoretical, operational and disciplinary aspects. Clearly expressed teaching concepts have extremely important guiding significance for teaching activities. It is necessary to transform the concept of empirical education, which focuses on instilling knowledge, into an innovative concept of education that is mainly based on cultivating ability and improving quality.

(2) Innovation in teaching mode. The teaching mode is a stable structural form of the teaching activity process under the guidance of educational thought, teaching theory and learning theory. It is a methodology system for carrying out teaching activities. It is the embodiment of teaching theory, and at the same time directly faces and guides teaching practice. Operationality is the bridge between teaching theory and teaching practice. Innovative education requires the promotion of teaching from "transfer knowledge" to "inspire innovation" and implement education based on exploring new knowledge.

(3) Innovation in teaching methods. Teaching means is a tool, media or equipment for teachers and students to communicate information to each other. It is a method of teaching with teaching aids. The development of information technology has profoundly affected the innovation and development of education. We must attach importance to the theoretical research and practical application of the modernization of teaching methods, establish a policy guarantee system to promote the modernization of teaching methods, and formulate a management system for modern teaching methods, so that the modernization of teaching methods can be implemented.

(4) Teaching management innovation. Teaching management is the application of the principles and methods of management science and teaching theory, giving full play to the management functions such as planning, organization, coordination and control, coordinating the various elements of the teaching process, making it run in an orderly manner and improving the effectiveness of the teaching process. Teaching management involves basic aspects such as teaching plan management, teaching organization management and teaching quality management. To correctly understand the relationship between management and reform and innovation, innovation needs to strengthen management, and scientific management requires innovation.

3. Teaching Reform is an Important Way of Innovative Education

Innovative education is a complex system engineering. The implementation of innovative education must be considered overall, integrated design, and gradually advanced. Teaching reform is an important way to implement innovative education and is of great significance to innovative

education.

(1) Teaching reform can promote students' ability to innovate. To cultivate students' innovative ability, it is necessary to create a good learning situation, stimulate the initiative and enthusiasm of learning, cultivate innovative thinking, encourage students to explore and cooperate independently. In the process of teaching, the key to solving teaching problems is the internal innovation and educational concept of education. Innovations and innovations in teaching methods; respecting individual differences among students, implementing tiered teaching, guiding students to boldly question and expand their ability to innovate. These all depend on teaching reform.

(2) Teaching reform can promote students' spiritual culture innovation. Spiritual culture is one of the theoretical structural elements of the cultural level. The spiritual home of the human being determines the spiritual state, spiritual life and spiritual essence of the human being. The teaching process is the process of inheriting and spreading the spiritual culture. The teaching content should enrich the students' cultural knowledge and spiritual life, thus promoting the continuation and development of the social spiritual culture. Therefore, teaching reform can continuously enrich, develop and innovate the spiritual culture of students.

(3) Teaching reform can promote innovation in teaching management system. The teaching management system is a general term for stability regulations that must be observed in teaching activities. It has the role of restricting students and teachers' actions and ensuring the orderly teaching. Establishing a sound and strict teaching management system is an important part of teaching work. Teaching reform has an impact on students' knowledge, values and ways of thinking. It also has an impact on the adjustment of the teaching staff and the teacher management system and can promote the innovation of the teaching management system.

4. Existing Problems of College Physics Experiment Teaching

There are many problems in the current university physics experiment teaching, which are highlighted in the following aspects:

(1) The practice content is too biased towards pure physics or classic physics. Physics is a deep-dimensional science that requires students to have higher imagination and unconventional thinking skills. Students with excellent physics in high school have generally gone to key universities. For ordinary local colleges and universities, pure physics teaching is still used, which is difficult to attract interest in learning, resulting in poor classroom teaching. These students prefer experimental projects that are simple and direct and have a high degree of relevance to the application. This poses a challenge to ordinary college teachers. How to set up experiments and write experimental textbooks suitable for students' characteristics will become an important topic in physics teaching.

(2) The discourse between theoretical teaching and experimental teaching. Although engineering colleges have established university physics experiment courses, due to the relatively concentrated start-up time, the large number of students, and limited physical experiment equipment, it is difficult to ensure that physics teaching and physical experiments are carried out simultaneously, causing serious decoupling between theory and practice. What is more serious is that Sometimes the experimental course is completed without theoretical teaching. And physics experiments are generally verification experiments. Even if students design their own improvement and modification programs during the experiment, they are only affected by various factors and only stay at the ideological level, which is not conducive to students' innovative ability.

(3) The operation is too programmed. Many university physics experiments, the lack of students' extended thinking is a common problem. The understanding of physical experiments usually comes from the teacher's classroom demonstration. Most of the students in the experimental class follow the steps prescribed by the teacher or operate according to the specifications in the textbook. They are only mechanical repetitions of the teacher's experimental behavior, and the operation mode is too much. There is no innovation and thinking in the experimental process. Many students forget the operation steps and experimental contents after the experiment is completed. The experimental teaching does not promote students' knowledge, which is not conducive to cultivating students'

thinking ability and inquiry ability.

(4) Too much reliance on simulation experiments. Simulation experiments are a basic type of scientific experiment, experimenting by mimicking certain conditions. With the continuous development of computer information technology and multimedia technology, more and more simulation experiment software applied in modern education, and university physical physics teaching is no exception. Although the simulation experiment software facilitates the experimental teaching to a certain extent, some university physics teachers rely too much on the simulation experiment, ignoring the actual experiment, which makes the students lose many opportunities for hands-on operation, and could not highlight the key points and details of the experiment. Therefore, the experimental teaching is not efficient.

(5) The experimental equipment resources are relatively scarce. Although colleges and universities continue to improve and improve their equipment, experimental teaching resources are still lacking. The laboratory only completes the experimental teaching tasks and is not open to the outside world. The laboratories and equipment are idle for a long time, and the investment efficiency is low. Most of the students did not enter the laboratory for scientific and technological innovation activities, which seriously affected the improvement of teaching quality and teaching effects. The construction of the laboratory is not enough. The old experimental instruments are not conducive to improving the scientific research level and academic level of the teaching staff, and lack of a practical platform, which makes it difficult to cultivate students' scientific literacy and practical ability.

5. Reform Measures of College Physics Experiment Teaching on the Background of Innovative Education

According to the requirements of innovative education, according to the problems existing in the teaching of university physics experiment, with reference to relevant research literature and the author's many years of experimental teaching experience, the reform measures of university physics experiment teaching under the background of innovative education proposed in this paper are as follows:

(1) Select and optimize experimental projects and update experimental teaching instruments. The experimental teaching project plays an important role in cultivating students' experimental ability, thinking ability and creative ability. On the one hand, the existing experimental projects are optimized, the outdated projects are eliminated, and the classic projects are retained; on the other hand, the experimental teaching instruments can be updated by purchasing or self-made methods. Under the premise of ensuring basic experimental teaching, update the experimental content and measurement method that is out of touch with the actual application, eliminate the outdated experimental project, add new materials and artificial intelligence experimental projects, and supplement and improve some classical basic physics experiments. Integrate modern educational technology into traditional experiments, give new content to basic experiments, and upgrade the level of experimental projects.

(2) Using modern educational technology to open remote experimental teaching. Open remote online physics experiment teaching, students use the campus network or the Internet to pre-class and post-class review of experimental teaching content, so that the teaching content is extended in time and space and promote students to fully learn and master the experimental teaching content. Open online virtual physics experiment, students can learn independently at any place according to their own time, broaden the horizons of students, meet the needs of students at different levels, provide students with independent physical experiment environment, and cultivate students' self-learning ability for experiments.

(3) Encourage participation in academic competitions and stimulate students' awareness of innovation. To carry out the discipline competition, on the one hand, to stimulate students' enthusiasm and creativity in learning, to improve practical hands-on ability and enhance team awareness; on the other hand, to promote teaching reform, update teaching content and teaching methods. The experimental center should pay attention to cultivating students' solid basic theories

and basic skills, and actively organize students to participate in various discipline competitions to create a stage for students to display and exercise. By participating in the experimental teaching skill competition, the ability of students to adapt to the society is significantly improved than in the past, which not only helps to improve the overall quality and teamwork awareness, but also promotes the construction of experimental teaching teams, and is also an important means of the intensive development of higher education.

(4) Conduct flexible teaching modes for different experimental levels. To enable students to master the knowledge and skills of physics experiments from the shallower to the deeper, and to provide a variety of experimental choices, reflecting the flexibility and expandability of open experimental teaching. Different levels of experiment use different modes. Independent design experiments, providing the required instruments and consumables, students complete the experimental content design, complete the experiment independently, analyze the experimental results, and finally display the experimental results in the form of experimental reports, videos or physical demonstrations. Design experiments, giving students more autonomy in the form of individual or teamwork, without limiting the experimental time. In the research experiment, the teacher gives the experimental topics at the forefront of different fields and leads the students with good foundation or interested to complete.

(5) Optimize the innovative education platform to motivate students to innovate. Establish multi-level open laboratories to meet the needs of independent experiments and research at different levels of students; use information technology to establish a digital experimental platform for simulation and numerical calculations for difficult, complex or difficult experiments, as a routine experiment supplement. Adopt a diversified experimental environment to broaden the time and space for students to innovate and meet the needs of students' individualized and innovative development. Set up a teacher-student interactive communication platform and give teachers affirmation and feedback in a timely manner. In addition, strengthening students' experimental ability and practical skills assessment can reflect the diverse assessment methods of students' scientific experiment ability, and stimulate students' initiative and enthusiasm to participate in physical experiments.

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