

The Reform and Implementation of Professional Teaching Management Model Based On the Experimental Material under the Background of “New Engineering”

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Keywords: New Engineering; Experimental Teaching; Management Mode; Teaching Process

Abstract: In recent years, the country has proposed an educational plan for the construction of the "new engineering", and The National Experimental Teaching Demonstration Center for Materials Science and Engineering (Donghua University) is an important experimental base for training new engineering talents in materials. The “One Support Two Platforms, Four Links, Six Roles” experimental teaching management model has subverted the traditional experimental teaching process, realized the online and offline hybrid experimental teaching process reengineering, more in line with the requirements of engineering education professional certification, and more conducive to the urgent need of the country Training of new engineering talents in materials.

1. Introduction

Nowadays, under the influence of the transformation of the global economy and the industrial landscape, my country's higher education is led by Li Deshu, and cultivates more application, compound, innovative and diversified talents suitable for the future social development [1]. Under the background of "new engineering", the National Experimental Teaching Demonstration Center for Materials Science and Engineering of Donghua University (hereinafter referred to as the "center") has reorganized the outstanding problems in the experimental teaching process and relied on "Internet +" to build a "one The experimental teaching management model that supports two platforms, four links, and six roles is more in line with the requirements for professional certification of engineering education, and is more conducive to the cultivation of new engineering talents that the country urgently needs.

2. Problems in the Original Experimental Teaching Management Mode of The Center

The center has always adhered to "student-centered", built a "one, two, three" level of professional experimental system, combining the material professional theoretical knowledge with practical problems, to cultivate students' practical ability and innovative spirit [2, 3]. The center explores an experimental teaching mode that is more suitable for the engineering talents needed by today's society, and has originally created a new "Internet +" experimental teaching mode [4], creating an online and offline organically integrated, collaborative and complementary experimental teaching process, breaking the traditional experiment With the teaching mode, the new experimental teaching management mode is also improved and optimized to solve some common problems in the experimental teaching process.

2.1 The Emerging Problem of Software and Hardware Resources in Experimental Teaching

The center has the dual functions of experimental teaching service and scientific research practice service [5]. In some colleges and universities, there are problems such as decentralized experimental teaching base, uncoordinated experimental practice teaching and scientific research

platform management [6], the implementation of the new model of "Internet +" experimental teaching. After that, experimental teaching occupied the opening time of scientific research to a certain extent, resulting in conflicts between teaching and scientific research resources. How to make scientific research resources support experimental teaching and realize resource sharing [7] is one of the problems facing the center.

2.2 The Connection between Experimental Teaching Process Assessment and Experiment Process

The center relied on the "Laboratory Intelligent Management System" [8] to realize online course selection, which solved the problems of tedious and low efficiency in traditional manual mode [9]. However, students lack of extracurricular experimental learning, have no overall understanding of the experiment, and cannot improve their innovation and practical ability. How to set up a process-oriented evaluation mechanism for experimental teaching and establish a unified evaluation standard is the second problem facing the center.

2.3 The Joint Problem of "Human" And "Thing" In The Process Of Experiment Teaching

Experimental teaching management usually focuses on the "things" of teaching affairs, and one-sidedly weakens the "people" who perform the affairs, which results in the unclear division of labor of the "people", the lack of awareness of teaching services, and the neglect of students' real learning needs or personalization. Development needs [10, 11]. Experimental teaching is like a play. If each character plays his own role without any interspersed communication, then the play loses its "soul". How to improve the subjective initiative of "people" in the process of teaching management is the third problem facing the center.

3. Construction of Experimental Teaching Management Model of "One Support, Two Platforms, Four Links and Six Roles"

The "one support, two platforms, four links, and six roles" experimental teaching management model is supported by the construction of a national experimental teaching demonstration center, optimizing software resources, upgrading hardware resources, and constructing online teaching platforms and physical experiment platforms; online and offline teaching management Organic integration, to create a complete teaching process, the experimental teaching management is divided into four parts: teaching arrangement, teaching preparation, teaching experiment, learning experiment, interlocking and mutually unified; experimental instructor, experiment instructor, experiment teacher, Laboratory administrators, experimental assistants and experimental students. There are different tasks and divisions of labor during the experiment. Collaboration and cooperation among the roles, unified standards, student-centered, student-learning experiment as the main line, dedicated to society Required innovation and engineering practice personnel training.

3.1 "One Support" Balances Software And Hardware Resources, and Strengthens the Construction of Experimental Teaching Base

3.1.1 Construction of Hardware and Software Resources "Experimental Teaching Hard Core Base"

In recent years, the center has followed the principle of integrated investment of "teaching priority, on-demand purchase, public priority, and special prudence" [12], using "Internet +" means to balance teaching and research resources to meet the needs of undergraduate teaching and scientific research; purchase advanced instruments Equipment, improve the function of experimental testing, and broaden the content of experimental teaching; re-arrange the laboratory into a professional basic laboratory and a comprehensive practical laboratory to ensure sufficient experimental teaching space and provide a "hard core base" for experimental teaching.

3.1.2 Perfect Laboratory System "Safety Base for Experimental Teaching"

The center produces safety micro-videos or animations in accordance with the requirements of

the laboratory safety system, overcomes the rigidity of the system, establishes a safety science media resource library, and visualizes the safety of the laboratory to teachers and students, and enhances the safety awareness and safety of managers and users Mastery of knowledge. Integrate asset library, system library and media library, establish a comprehensive, accurate and dynamic laboratory safety information database, build a laboratory online and offline safety self-check mode, realize a long-term laboratory safety management mechanism, and provide laboratory teaching with "Safe base".

3.2 "Two Platforms" Derived Experimental Teaching Methods, Improve the Experimental Teaching Process

The center builds an online teaching platform, reorganizes the physical experiment platform, and derives the "interfusion of online learning and offline experiment" experimental teaching method. It takes students as the center and learns by teaching, so that students can learn. A hybrid teaching method combining online and offline to cultivate students' self-learning ability, communication ability, hands-on ability and teamwork ability, the assessment project penetrates into different stages of the experiment, forming a "longitude and latitude structure" with the learning process as the main line and embedded evaluation assessment Relationship, experiment and assessment process is more complete.

3.3 "Four Links" Run Through the Experimental Teaching Process, And Upgrade the Definition Of "Six Roles" Responsibilities

3.3.1 "Four Links" Overall Management to Ensure the Operation of Experimental Teaching

The new experimental teaching process covers four parts: teaching arrangement, teaching preparation, teaching experiment and learning experiment. The teaching arrangement is to achieve the implementation of the teaching plan; teaching preparation should integrate online resources such as virtual video courseware, question bank, course selection and other courses. , But also supporting physical resources such as instruments and equipment, experimental consumables. The teaching experiment is the main stage of the experimental course. The teacher is the mainstay. Before the class, the online students' learning behavior is analyzed. In the class, the teaching plan is changed according to the statistical results to carry out the physical experiment. The "learning experiment" takes students as the main body, online learning, offline experiment, full assessment, and truly realizes "learning to apply".

3.3.2 The "Six Roles" Have Clear Responsibilities and Optimize the Experimental Teaching Process

"Six roles" completely interpreted the new experimental teaching process. The experiment lecturer and experiment faculty have a clear understanding of the experiment course teaching plan, and flexibly control the arrangement of experiment people, things, and materials; laboratory administrators and experiment assistants should assist in the completion of experiment teaching preparation and safety. Experimental teachers analyze the data of online learning, formulate teaching plans based on professional certification talent training goals, and create interactive experimental classrooms; experimental students enter the laboratory to carry out experiments and complete the entire experimental process of learning. The "six roles" communicate and assist each other, streamline the main line of experimental teaching management, continuously optimize the experimental teaching process, and enhance the height of experimental teaching.

4. Implementation of the Experimental Teaching Management Model of "One Support, Two Platforms, Four Links and Six Roles"

4.1 The Implementation of the Experimental Teaching Management Model

The various systems formulated by the "One Support" National Experimental Teaching Demonstration Center are communicated to teachers and students in the form of lectures,

announcements and online examination questions, so that the participants of experimental teaching should not only follow the principles of teaching management, but also explore experimental teaching. Management flexibility, balance scientific research teaching resources, and implement the implementation of experimental teaching management model.

The "two platforms" online teaching platform enriches the online teaching resources through the feedback of teachers and students, refines the experimental assessment questions in blocks, improves the big data analysis function of assessment management, gains an in-depth understanding of students' learning mastery, and evaluates teachers' teaching effects. The physical experiment platform newly opened 2 elective courses and 10 experimental projects to expand students' knowledge and improve students' innovative ability.

"Four links" is a restructuring of the experimental teaching process. "Six roles" shines in all links, reflecting its own value and enhancing its sense of responsibility. The linkage between "four links" and "six roles" has promoted the teaching management model. Implementation in each experimental course.

4.2 Implementation of Experimental Teaching Management Model in Experimental Courses

Driven by the new experimental teaching management model, students' consciousness and initiative in learning experiments have been greatly improved, the sense of experimentation has been enhanced, the frequency of online and offline teacher-student interaction has increased, and the quality of experimental teaching has been improved.

The relevant experimental teaching achievements have won many awards, and the relevant experimental courses have been awarded the Shanghai Excellent Course and the Virtual Simulation Project. In the past three years, 100 universities such as Shanghai Jiaotong University and Jiangsu University have visited and exchanged, and the new model of "Internet+" experimental teaching has been praised and referenced by peers.

The new management mode makes the experimental teaching resources more abundant, the experimental teaching methods more flexible and diverse, the experimental learning environment is more novel and vivid, and the experimental teaching process is more complete and smooth, which can better meet the needs of students in the new era [13] Cultivating innovative and practical talents in materials majors has opened up a new world.

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