

Teaching Reform and Practice of Computer Application Course in Material Science and Engineering Based on "Internet +"

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Abstract: As the normalization of epidemic prevention and control, the school has returned to the course in an all-round way. How to use information technology to reform the course teaching method, expand the teaching content, improve the teaching efficiency, expand the teaching scale and realize the independent learning of students and cultivate more excellent professionals for local development is the new requirement of education and teaching reform in local colleges and universities. Taking the course teaching of computer application in material science and engineering as an example, this paper discusses the teaching research and practice of "three standards and one system, three-dimensional promotion", Integrate classroom teaching resources, Construction of course teaching network sharing resource library and online open course teaching platform based on the background of "Internet+".

1. Introduction

With the normalization of epidemic prevention and control and the entry of various industries into the information era [1,2], the teaching application, R&D, industrial utilization and development of computer-related technologies in the field of material science and engineering are important topics that we must face. As an important elective course for the major of material science and engineering, the application of computer in material science and engineering focuses on the above points of view, and strives to introduce the analysis and establishment, numerical processing [3,4] and implementation of computer mathematical model in the process of material processing and preparation comprehensively, systematically and simply, so as to improve the computer application level of students. To enable students can adapt to the needs of computer application in the material industry after graduation.

2. Curriculum and Learning Situation Analysis

2.1. Teaching Status of Courses

The teaching system of computer application course in material science and engineering for material science and engineering major of Hanshan Normal University was formed at the beginning of 2016. In recent years, although some reforms have been made to the teaching system of this course, the basic framework has not changed. From the perspective of adapting to the development of information era, the teaching system of computer application course in materials science and engineering major has some problems such as single content, poor interdisciplinary and so on; the content of some courses is aging and fall behind the current situation and trend of the rapid development of material science. The teaching content of the course focuses on the field of photoelectric materials, and does not form a vertical arrangement on the whole industrial chain of local pillar industries such as ceramics; Moreover, the practical teaching method is limited to the form of centralized computer experiment, which lack flexibility, autonomy and interdisciplinary. The existing curriculum teaching system and methods cannot meet the training needs of new engineering talents in the 21st century, breaking the existing cramming teaching method, enriching the curriculum teaching content; exploring new teaching methods and so on have become urgent problems to be solved.

2.2. Course Features

The application of computer in material science and engineering is a multi-disciplinary elective course set up for undergraduates by the major of material science and engineering of Hanshan Normal University in combination with the local characteristics and advantages of this discipline in the fields of luminescent materials, functional ceramics and living ceramics. The purpose of the teaching is to cultivate students' ability to solve complicated engineering problems in the process of material processing and preparation. Through the course study, students are familiar with the application progress of computer-related technology in the field of material processing and preparation, master the methods of data acquisition, model modeling and solving methods in the process of different material processing and preparation, and can utilize the built model to analyze the different characteristics and internal rules of different material processing technology, and analyze, model and solve the adsorption of porous material, material physical property parameters, ceramic material preparation flow and other processes. Ability to use modern information tools and interdisciplinary methods to solve practical engineering problems. Compared with other professional courses, the computer application courses in material science and engineering has the following characteristics.

First, interdisciplinary. No matter the content of computer application in material science and engineering, or the method of using computer to solve the engineering problems of complex material preparation, all involve the professional knowledge and methods of materials engineering, computer technology, mechanical engineering, information technology and other disciplines. Therefore, there are many and scattered knowledge points to be taught in the course. It is impossible to teach all the knowledge points involved in the course in the classroom on the premise of ensuring the quality of teaching and learning.

Second, the course content is abstract and boring. Through the study of the application of computer in material science and engineering, students are required to establish and solve the model of material preparation process by means of interdisciplinary methods such as computer technology, numerical calculation and solid modeling on the basis of mastering solid material science foundation, material engineering foundation, material preparation process and other relevant basic

theories. For such abstract content, if the teaching method is mainly used, it will not only reduce students' interest in learning, but also greatly reduce the learning effect. It will also reduce students' expectations for the prospect of the professional industry and reduce students' learning enthusiasm.

Third, the curriculum task is heavy and has much of practical content. The course of computer application in materials science and engineering is planned to have 48 class hours, among which 40 class hours are practical training operation in computer room. Because students need to complete the modeling software SolidWorks, simulation software Ansys, Installation and use of material computing software Materials Studio. Therefore, at the same time of explaining the basic theories and methods, teachers should also increase the way of classroom demonstration and pay attention to the cultivation of students' practical ability.

The above-mentioned course characteristics determine that the application of computer in material science and engineering is not only different from the courses of fundamentals of material science and engineering, but also different from practical courses focusing on practical ability such as material preparation and analysis [5]. The application teaching of computer in materials science and engineering under the background of "Internet +" breaks through the traditional time and space restrictions, and can integrate the teaching resources of various famous teachers on the network platform, integrate the practical application of field engineering, greatly enrich the teaching content and stimulate students' interest in learning. Therefore, in order to enhance the students' interest in the application of computer in materials science and engineering, to cultivate interdisciplinary talents with the ability to use professional knowledge, modern information tools and interdisciplinary methods to solve practical engineering problems. The existing teaching mode cannot meet the teaching needs of this course in terms of teaching resources and teaching methods. Therefore, it is necessary to actively seek and construct a new teaching mode [6].

3. Reform and Practice of Curriculum Reform Based on "Internet Plus"

3.1. Build the Curriculum Teaching System of "Three Standards in One and Three-dimensional Promotion"

According to the requirements of the development for new engineering education and the construction of major with characteristics of material science and engineering, in combination with the discipline and platform advantages of the school in the field of photoelectric materials and ceramic materials, the student-centered and output-oriented teaching concept, as well as the teaching requirements of curriculum ideology and politics, the course teaching system of Computer Application in Material Science and Engineering has been revised and improved. Further optimize the curriculum teaching content design. And the development of local industries is taken as the basis for configuring and defining course content in terms of computer comprehensive application skills for professional and technical personnel. Guided by the goal of enhancing abilities, the teaching approach moves away from the traditional "inherent-imparted" mode of course content setting, and follows a path from simulation to practice, from knowledge to implementation. Guided by the goal of cultivating new engineering talents, the teaching content is designed on the basis of teaching strengths, including luminous materials, daily ceramics, and porous material simulation, stainless steel processing with multiphysics simulation, ceramic material physical property simulation and calculation, ceramic material preparation process simulation and design, and molecular dynamics simulation of ceramic materials. The course content is arranged vertically based on the local pillar industry chain, ultimately creating teaching content that enhances teaching through three dimensions of "three standards and one system" (three standards referring to industry standards, national standards, and international standards, and one system referring to systematic comprehensive practice), thereby promoting the development of collaborative innovation that drives

the development of high-skilled personnel in mobile internet.

3.2. Implementation of Teaching Method of "One Main Line, Five Steps and Four Syncs"

According to the characteristics of computer application courses in material science and engineering, the teaching methods and means are reformed by taking the simulation and practical training of multi-physical field simulation project in material processing process as the carrier, guided by the actual requirements of the post and aiming at the cultivation of engineering practice ability [7]. In the course teaching implementation process, starting from solving the practical engineering problems in the process of material processing and preparation, and taking problem solving investigation, project establishment, practical training, inspection and evaluation as the steps, the situation-oriented project of MOOCs, case teaching, virtual simulation teaching and stratified teaching as the four teaching methods and methods are jointly constructed. Through this reform of teaching method, the classroom teaching atmosphere gets active, the learning interest of the students is improved, and the innovation, entrepreneurship and employment of the students form a connection.

3.3. Establish Intelligent Course Teaching Platform Based on "Internet+"

In order to cultivate the improvement of students' practical engineering application ability, course teachers conduct in-depth practical research in cooperative enterprises, collect a large number of real production cases and video materials, and integrate the teaching resources inside and outside the course (course-related pictures, videos and examination questions) through literature research, data inquiry and learning platform. A sustainable and updated course network resource library (course resource library, practical training resource library, homework database and material database) is constructed. In addition, in combination with the characteristics of computer application course in material science and engineering, based on several modeling and simulation optimization software such as SolidWorks, Ansys, material studio and course teaching content, the "Internet +", "cloud desktop" and distributed network service open architecture are adopted. The teaching platform of computer applied wisdom course in materials science and engineering (see Figure 1) and the national virtual simulation experiment teaching course sharing platform are constructed, enabling students to access the course online teaching platform anytime and anywhere through the Internet client, to learn online knowledge points and carry out simulation teaching experiments.

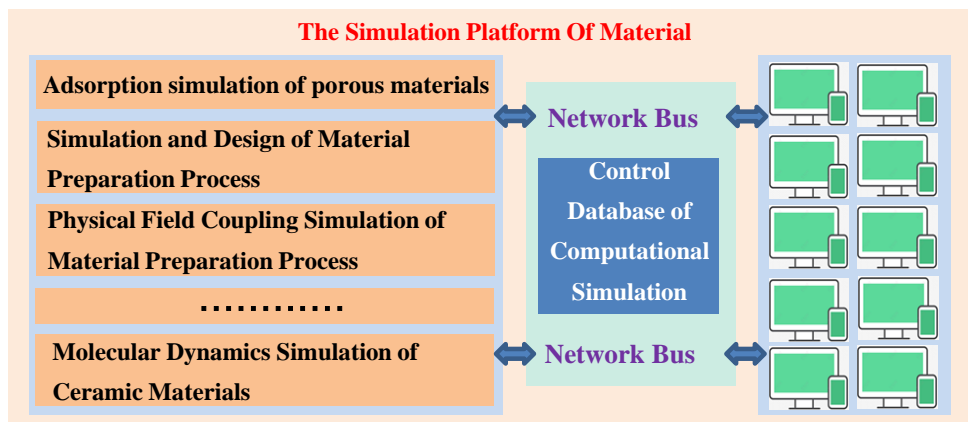


Figure 1: Course simulation teaching platform

4. The Achievements and Reflection of Curriculum Teaching Reform Based on "Internet Plus"

4.1. Achievements of Teaching Reform

Through the construction of the new curriculum teaching system of “three standards in one and three-dimensional improvement”, the requirements of the new engineering talent cultivation and student-centered and students’ learning-result-oriented education concept are followed, and the requirements of the material industry on the computer application capability of professional technical talents are met [8,9]. The course teaching method with one main line, five steps and four synchronizations has enlivened the classroom teaching atmosphere, enhanced students' subjective initiative in learning, enhanced the integration and interest of course learning, and achieved better teaching effect [10]. The constructed online teaching courses improve students' interest and effect in course learning, improve students' practical ability to apply computer and other information technology to solve complex material engineering problems, and form a school-enterprise integration of “systematic practice, internal and external communication, school-enterprise win-win” cooperative curriculum education model (see Figure 2).

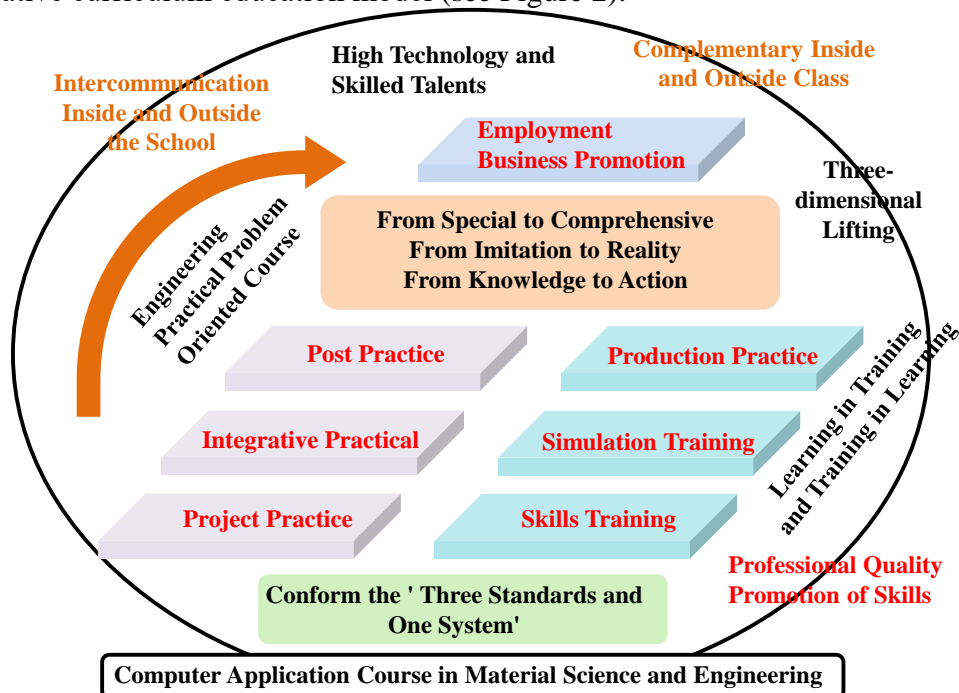


Figure 2: Teaching mode of “system practice, internal and external communication, win-win of school and enterprise” with deep integration of school and enterprise

4.2. Go Online in a Civilized Manner and Innovative Thinking in the Course

The core of the course of computer application in materials science and engineering based on "Internet+" is to give students the initiative in learning, give full play to their subjective initiative in exploring and solving problems, and realize the high-quality teaching centered on students. In the course implementation, a lot of Internet resources need to be used, which needs to be distinguished and used in a civilized way. Besides, when using commercial software for practical training of enterprise projects, it is necessary to have the awareness of achievement confidentiality and data security.

5. Conclusion

In the post-epidemic Internet era, the teaching model based on "Internet+" is imperative. By implementing a series of course teaching reforms on the application in material science and engineering, this paper gives full play to the role of "interconnection+" related technology in the application of computer in materials science and engineering, realizes the organic integration of "internet+" related technology and course teaching, expands and optimizes the teaching method and content of the course, solves the problem of insufficient teaching content, etc. and the teaching efficiency is improved.

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