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Reform and Practice of the Course "Application of Computer in Materials Science"

Li Li*

Juyu New Materials Co., Ltd. E-mail: lili@sina.com

Abstract: The application of computer in materials science, as a professional basic course for undergraduates majoring in materials science and engineering, is both theoretical and operational. At the same time, the practicality and applicability of this course are also obvious. Therefore, there are great challenges for teachers' teaching and students' learning. Based on this, combined with the teaching characteristics of the subject, this article explores the teaching reform and practice in terms of teaching content, teaching means and teaching methods, in order to improve the training of high-level applied talents in colleges and universities. The curriculum reform has changed the traditional one-way knowledge transmission teaching mode, which is of great benefit to cultivating students' engineering literacy, engineering practice ability and innovation ability.

Keywords: Computer Application; Materials Science; Curriculum Innovation; Teaching Skills

1. Introduction

With the continuous development of social economy, information technology and science and technology have gradually covered our daily necessities, and brought considerable help to our work and life. As a modern tool, the role of computer in various fields cannot be ignored. Materials science is a new interdisciplinary science, whose substantive development is not mature, and it still needs to accumulate theoretical knowledge and practical application by virtue of facts and experience. For this reason, computers have played an important role in the research of materials science. Computers can not only help material experts design and analyze new materials and manufacture new alloys, but also help them complete extremely complex material design. To sum up, the application of computer technology has promoted the development and progress of materials science research to a certain extent. With constant attempts and practice, computer technology has gradually become a new way of material science research, and has been applied to the design of new materials, optimization of technological process and automatic control, data analysis and image processing, calculation and simulation of house position, material composition and structure analysis, etc.

In addition, the course "Application of Computer in Materials Science" has strong professional comprehensiveness and technical characteristics of the times. The purpose of this course is to enable students to learn how to use computers to solve practical problems in materials science and engineering, to cultivate their related abilities, to enhance the sense of innovation in the process of learning, and to grasp the research frontier and development trend of computer technology in materials science. However, the knowledge content of some chapters is abstract, which is difficult for students to really understand, such as numerical calculation methods, and deri-

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vation of calculation principles. It is difficult for students to absorb such boring and unintelligible knowledge, which will affect the teaching quality of teachers. In addition, in the vast majority of computer experiment teaching, the teaching forms are relatively simple, that teachers teach software principles, operation steps and application methods in one direction. However, students only carry out a series of verified practical operations, and do not participate in learning activities that are truly combined with engineering practice. Therefore, it is difficult for them to apply theoretical knowledge to practice, and it is even more difficult to find out their own problems in this subject, which in turn affects students' learning enthusiasm.

Therefore, in order to achieve the teaching goal of "cultivating practical talents" in today's society, teachers need to scientifically screen, summarize, analyze and construct the teaching content of "Application of Computer in Materials Science", and reform teaching methods and update teaching means to effectively improve teaching quality and level.

2. Course objectives

The objectives are to strive for a smooth connection between the professional setting and the industrial demand, the curriculum content meeting the requirements of professional standards, and compatibility between the teaching process and production process. Taking high-level applied talents as the basic training goal of this major and relying on paying attention to explaining the basic methods and principles, teachers should focus on explaining the industrial application technology of contemporary computers. Towards the development direction of today's materials technology, combined with the results of current scientific research practice, a curriculum system based on ability training should be built to train students' operational ability in computer software and hardware experiments, and enhance their engineering awareness, engineering literacy and engineering practice ability.

3. Curriculum reform and practice

The course "Application of Computer in Materials Science" offered in the major of Materials Science and Engineering needs to be reformed and practiced in teaching content, teaching means and teaching methods. It can be reflected in the following aspects:

(1) To strengthen practical application

The course "Application of Computer in Materials Science" should focus on cultivating students' engineering technical ability. According to the actual process and steps of computer application in materials science and engineering, combined with the equipment and equipment related to computer application in materials science and course experiments in the professional laboratory of Materials College, the teaching situation of emphasizing theory but neglecting practice should be changed, and the experimental teaching content should be reorganized and integrated into innovative and comprehensive experimental projects. With the help of experimental teaching, students' engineering quality, engineering practice ability and innovation ability are cultivated.

For example, teachers can set up a comprehensive experiment of "real-time tracking of crack initiation and propagation during material stretching" when carrying out teaching activities. Students are encouraged to participate in learning activities by designing and building materials testing devices by themselves, and collect the dynamic data of experiments in real time, and process the experimental data with the help of computer software, and finally get the experimental results. In this process, students' engineering practice ability and innovation ability can be improved. Comprehensive experiments are helpful to stimulate students' desire for knowledge and exploration. Students can even experience the combination of computer software and hardware and materials science experiments in the experiment process, and then enhance their engineering awareness and engineering literacy, which will lay a good foundation for future study and development.

(2) To enrich the teaching content

Teachers can combine practical engineering, transform completed scientific research projects into teaching materials, let students combine practical examples of scientific research practice, fully mobilize students' subjective initiative in learning, and strengthen students' ability to use computers to solve practical problems in material engineering. At the same time, students can use the knowledge content of other professional courses to interact well in the learning process. This requires teachers to collect and accumulate more example teaching materials, so as to enrich classroom knowledge, enable

students to gradually find the difference between what they have learned in class and actual engineering, enable students to have a more real grasp of the data and situation of actual engineering, and then make a better transition from theoretical knowledge to practical application.

For example, when teachers explain the physical field simulation of material heat treatment process, they use ANSYS software to simulate the temperature field in the cooling process of high-strength steel plate. In this process, the post-processing function of the software can visually display the distribution and changes of the internal temperature field of high-strength steel plate during the cooling process, while students will have a better understanding of the basic principles of numerical calculation in class. In addition, students can have the opportunity to operate on the computer while understanding, and realize a series of whole-process learning from modeling to practical operation and result analysis, so as to further improve the ability of solving practical problems.

(3) To establish an interactive communication platform

Teachers of the course "Application of Computer in Materials Science" can create an exclusive digital teaching platform for students with the help of the advantages of multimedia teaching and network teaching in today's era, and provide students with online autonomous learning places and interactive teaching places through the platform. The theoretical link in the course can be arranged in the multimedia computer room on campus, while the practical operation can break the limitation of time and space and conform to the trend of modern development. Digital multimedia technology has its own advantages and characteristics, which can bear all the relevant knowledge content in the course and present it to students in various forms. Students can also find and explore the problems found in practice through the convenience of the network while doing practical work in the network environment. The platform can provide students with an environment for questioning and communication, so that students can ask teachers online, or discuss problems with classmates in the form of groups and friends, and discuss the functional skills of operation together. Teachers exist as hosts, sharing the demonstration of software operation steps for students, so that students can understand and master the software functions more accurately and intuitively. This teaching method of sharing information resources is convenient for students. If a student finds a problem in the process, he can take the initiative to ask the teacher, and the teacher can solve the doubts for those students with the same problems through online demonstration, thus improving the teaching efficiency and teaching quality. For some important and difficult contents encountered in teaching, teachers can emphasize for students with this platform, so that students can find out their blind spots in software operation and application in time while practicing on the computer, and combine theoretical knowledge with practical operation organically to promote the improvement of learning efficiency.

(4) To establish a process assessment mode

In view of the strong application and practicality of the course "Application of Computer in Materials Science", educators should strengthen students' mastery of application and practice ability. The most direct method is to use regular assessment to test students' mastery of this skill. Therefore, it is imperative to establish a process assessment model. In the course process assessment mode, it is necessary to focus on the students' ability to apply theoretical knowledge in the learning process to practical operation. The assessment model can verify the periodic achievements in the process of students' learning from various aspects and forms. The course assessment of "Application of Computer in Materials Science" can be divided into two parts: one is the process assessment, which takes the students' daily computer operation performance in class as the assessment basis; furthermore, the comprehensive ability at the end of the term should be inspected to verify the students' mastery of comprehensive applied knowledge.

In the whole assessment process, teachers can assess students' online and offline operation ability separately, and examine students' online operation by means of small-scale experiments and students' comprehensive ability by means of after-school teamwork operation, so that students can supervise their own learning situation in many aspects and at different levels, thus improving their engineering practice ability and innovation ability. However, a written test is indispensable in the final exam, aiming to enable students to have a solid grasp of basic theoretical knowledge.

4. Conclusion

The "Application of Computer in Materials Science" is a professional basic course, which has the distinct characteristics of strong practicality and applicability. Teachers need to explore and reform from teaching contents, teaching methods and teaching modes, and find better teaching schemes through continuous practical exploration, and then improve the traditional one-way knowledge transmission teaching mode, enhance classroom interaction, and transform abstract knowledge into concrete things as much as possible, so that students can master what they have learned more deeply in the learning process. At the same time, teachers should pay attention to the practicality of this subject, strengthen students' practical ability in teaching, and let students get the training of using computer to solve practical problems of material engineering in comprehensive experiments, then arouse students' innovative consciousness, and lay a solid foundation for their future course study and professional development.

References

1. Wu B, Suning. Application of computer in material engineering (in Chinese). Southern Agricultural Machinery 2016; 47(12): 121–122.
2. Liu J. Talking about the teaching reform scheme of the application of computer in materials science (in Chinese). Learning Education 2014; (18): 159–160.
3. Li D, Zhou X. Teaching innovation and exploration of "Application of Computer in Material Engineering". Science and Education Exchange 2017 (12): 48–49.
4. Han Q, Li T, Zhao M, *et al*. Discussion on curriculum reform of computer application in materials science (in Chinese). Inner Mongolia Education 2011; (9): 20–21.