The Application of CAD/CAE Technology in the Teaching of vehicle Engineering Specialty

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Abstract. Good teaching method is an important way to improve teaching quality and cultivate students’ creative thinking. This paper mainly describes the application of CAD/CAE technology in vehicle engineering teaching, enriched teaching methods, can improve students’ ability of learning and engineering practice, improve teaching quality, and has good practical significance.

1. Introduction
With the rapid development of economy and the demand of society, the influence of computer aided design / computer aided engineering (CAD/CAE) technology in engineering design, structural analysis and optimization is becoming more and more important, which can make the design work more intuitive, accurate and fast. It not only improves the design efficiency and quality of the product, but also shortens the design cycle and development time of the product, thus improving the production efficiency of the enterprise, reducing the production cost and reducing the labor intensity of the technicians. Therefore, CAD/CAE technology has become an indispensable technical means in modern industry. Automobile industry is no exception, in the production and manufacturing process, can not be separated from the application of CAD/CAE software. With the vigorous development of the automobile industry, China has become the largest country in the world in automobile production and marketing. As an important pillar industry of our national economy, the automobile industry has been listed as one of the key industries by the Chinese government. In order to narrow the gap with the international advanced level and enhance the competitiveness of automobile enterprises, the current society urgently needs the support of new engineering talents. It is urgent for colleges and universities to adapt to the present and face the future to carry out new engineering construction and explore a more individualized and diversified talent training model. Comrade Xi Jinping clearly pointed out in the report of the 19th CPC National Congress: building a powerful educational country is the basic project for the great rejuvenation of the Chinese nation, and we must give priority to education, speed up the modernization of education, and do a good job of education that the people are satisfied with. We will speed up the construction of first-class universities and first-class disciplines and realize the implicit development of higher education. Therefore, all kinds of engineering colleges and universities in our country have set up the teaching of CAD/CAE technology one after another, trying to train some high-level technical talents with rich theoretical knowledge and strong practical ability.
2. The advantage analysis of the application of CAD/CAE technology in the teaching of vehicle engineering specialty

The application of modern teaching methods, such as multimedia, mooc, remote network real-time interactive teaching, can make effective use of all kinds of learning resources in the process of teaching and learning, and the teaching mode centered on teaching materials is gradually eliminated, and student’s comprehensive understanding of knowledge is more diverse. Through the study of AutoCAD, CATIA, ANSYS and MATLAB and other software, combined with the professional knowledge of vehicle engineering, students can greatly reduce the difficulty of learning, stimulate enthusiasm for learning, improve learning ability, so that students can obtain more intuitive and vivid information, so that knowledge and cognition can be consolidated, and the memory ability and understanding ability of the brain can also be improved. It reflects the combination of vehicle engineering teaching and CAD/CAE technology.

3. The practical application of CAD/CAE technology in the teaching of vehicle engineering specialty

3.1 Application in the Teaching of Mechanical drawing

The traditional Mechanical drawing course requires students to do a lot of exercises, students will spend a lot of time in completing the drawing homework, especially when drawing the model with complex graphic structure, it will take a day or a few days to draw. Using CAD software drawing will effectively shorten the drawing time, let the students complete the drawing in the shortest time, and master the structural characteristics of the drawing. In the traditional teaching mode, teachers collect paper homework and correct it one by one, the workload is heavy, and the feedback is difficult. Many students will not think about the cause of the mistake and do not correct the mistake. Moreover, because the traditional teaching methods are generally based on teaching materials, the teacher explains several orders and then lets the students practice, which results in the disconnection between theoretical teaching and practice, and students often forget the front after learning.

By using CAD technology, teachers can make standardized and beautiful graphics, and students can also intuitively see their own mistakes, which effectively improves students’ drawing ability. Because CAD technology is a course with high requirements for practical application, teachers should guide students around practical things in practical teaching, and cultivate students in all aspects on the basis of improving students’ understanding of theory, so as to improve students’ spatial imagination and thinking ability. Strengthening practical teaching in teaching is beneficial to the improvement of students’ design ability, and makes students have broader ideas and fun in drawing.

3.2 Application in the Teaching of Automobile Construction course

This course mainly introduces the structure and principle of engine and chassis, which has many contents and complex structure, but the book is basically the assembly relationship expressed by two-dimensional diagram. It is difficult for students to learn and can’t deeply understand the basic structure of automobile. The teaching cost of traditional automobile structure experiment is high and the resource consumption is large, and it is necessary to disassemble the solid structure to understand the internal structure of parts, and the component structure can’t run under the condition of disassembly, so it is impossible to express the internal structure and motion state of automobile structure at the same time in the traditional experiment.

CAD/CAE technology can be used to create a simulation environment that completely or partly replaces the real experiment. Students can carry out all kinds of automobile virtual assembly and disassembly experiments, practice operation, understand the principle of automobile construction and assembly, steps, and exercise operation skills, so that students can learn the structure and working principle of automobile more intuitively.
3.3 Application in the Teaching of Automobile Design course

Automobile design is one of the main courses of automobile engineering specialty. Its purpose is to make students learn to use modern automobile design method and master advanced automobile design technology on the basis of systematic understanding of automobile performance and basic structure, so as to achieve basic ability to analyze and solve problems in this field. Automobile design is a practical course, which makes comprehensive use of the knowledge of university basic courses, professional basic courses and professional courses. It has a large professional span and involves a wide range of fields, especially involving a lot of engineering practice and the application of new technology, so it is difficult to teach. The application of CAD/CAE technology in the classroom teaching of automobile design can accurately obtain the motion trajectory, kinematic characteristics and dynamic response values of the mechanism, qualitatively describe the principle of the mechanism, and simulate the actual working state. Therefore, the application of CAD/CAE technology can not only effectively solve the problems encountered in design, improve students’ design ability and interest in learning, but also further strengthen students’ understanding and mastery of professional knowledge, and also provide an opportunity for students to combine with production practice more effectively after graduation.

3.4 Application in graduation Design of students

Students used to do graduation papers are comprehensive and research articles, the design class is less, because the design thesis design involves drawing and simulation, and the drawing is drawn by hand, which takes a lot of time and energy of students, which affects the enthusiasm of students to learn. Learning CAD/CAE software, from drawing two-dimensional graphics to solid modeling and assembly, to finite element simulation analysis, from easy to difficult, these advanced, fast and effective design methods will make students have a strong curiosity and stimulate their interest in learning, thus changing from "let me learn" to "I want to learn". The title of graduation thesis in the design category has also become the object of students’ candidacy.

3.5 The influence on the employment of students

CAD/CAE course mainly trains students to master the basic knowledge, basic theory and operation skills needed for computer aided design, manufacture and analysis, so that students have good professional accomplishment and comprehensive professional ability, and have strong practical ability and innovative spirit. At the same time, combined with professional knowledge, the theory and practice are combined organically to guide students to study independently, to think actively, to stimulate students’ innovative consciousness, and to narrow the distance between curriculum learning and high-level social demand. After graduation, students can engage in design and software secondary development in engineering, design, high-tech and other enterprises and institutions, and become top-notch innovative talents to meet the needs of social development.

4. Conclusion

In a word, the application of CAD/CAE technology to the teaching of vehicle engineering specialty is beneficial to the “teaching” and “learning” of the course, enriches the teaching content, reforms the professional experimental teaching mode, and breaks through the limitation of time and space in the previous experimental teaching. In the process of professional teaching, teachers show the convenient and powerful function of CAD/CAE technology, make the teaching method more flexible, completely change the traditional boring teaching methods, stimulate the enthusiasm of students to learn, improve the effect of classroom teaching and improve the teaching quality, promote the overall teaching effectiveness of vehicle engineering specialty and train more and more high-quality professional talents for the society, and bridge the strong talent gap in the market.
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