

Teaching Reform and Practice of Engineering Drawing and Electrical CAD

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Abstract. This document analyses the common problems existing in the teaching of "Engineering Drawing and Electrical CAD" at present, expounds the beneficial exploration on the teaching reform of "Engineering Drawing and Electrical CAD", innovates the teaching content, integrates the project teaching method of CDIO concept into the teaching method, and puts forward the reform mode of "integration of lesson certificates" in the examination method. The practice shows that the above measures are effective. It has achieved good teaching effects, such as effectively improving students' ability to master practical skills of electrical CAD, cultivating students' comprehensive quality, improving teachers' teaching level and enhancing students' ability to analyze and solve practical engineering problems.

1. Introduction

Engineering Drawing and Electrical CAD is a compulsory course for electrical engineering majors and one of the basic courses for students to learn basic professional skills. In order to flexibly and organically insert the course of engineering drawing and electrical CAD into the same classroom teaching, stimulate students' interest and enthusiasm in learning while cultivating their spatial thinking ability, and then jointly improve the teaching quality, so that students can better and faster grasp the practical skills of electrical engineering CAD, so as to enhance their employment ability. It is very necessary to carry out relevant curriculum reform for this course.

With the principle of training applied talents as the goal, combine the national standards of electrical technology with practical application closely in a Targeted Way, so that students can master the correct method of drawing electrical engineering drawings by using CAD technology after learning this course, and can apply basic knowledge and methods of electric power design to solve practical problems.

2. The common problems existing in the Teaching of Engineering Drawing and Electrical CAD

This course mainly uses AutoCAD software to draw and design electrical engineering drawings related to power system or other electric power. It is a software course with strong practical skills. Because the inherent mode of AutoCAD software teaching can not be separated from teaching, it is easy for teachers to have the following common problems in teaching:

In terms of teaching content, it pays more attention to the basic commands and operations of the software, the teaching content is scattered, which is out of touch with the practical engineering application design, and the combination of teaching and industry technology is often neglected.

In terms of teaching methods, the contents are taught in accordance with chapters. There is a significant gap between teaching effect and CDIO concept - using comprehensive design projects close to engineering practice to teach students to achieve the training objectives of students' creative ability and problem solving ability. Some schools adopt the teaching method of "multimedia classroom + computer room", which makes theory teaching and computer practice not synchronized,

resulting in knowledge easy to forget and difficult to get good learning effect in limited classroom time. Some schools complete all the hours of the course in the computer room, effectively manage students' attention in class, and can well integrate speaking, acting, learning and practice. Make full use of classroom time to make students achieve good learning results, but due to the influence of electronic devices such as mobile phones, it is very difficult to manage teaching discipline in electronic classroom.

In the aspect of assessment, most teachers make examination papers according to the teaching content and the students' mastery of the course content. The examination content is not comprehensive, which directly affects the students' enthusiasm and initiative in learning and mastering all knowledge points, and also leads to the poor improvement of students' skills and practical ability, and even does not possess the basic practical engineering software application ability required for their posts. ◦

In order to better solve the above problems, improve the teaching level and teaching effect, and train applied talents with practical skills of electrical engineering to meet the needs of social development, this paper carries out reform in the teaching process of engineering drawing and electrical CAD, and studies and explores in teaching content, teaching mode, assessment methods and other aspects, in order to further improve the students' practical skills and application ability of electrical engineering CAD, and better cultivate students' comprehensive quality.

3. Optimizing Teaching Content and Combining Theory with Practice

Relying on AutoCAD2008 drawing software, this paper introduces in detail the operation method of AutoCAD2008 system, the basic knowledge of common electrical drawings involved in electrical engineering, and the drawing methods and skills of typical electrical drawings. According to the training goal of college applied talents, by combing and integrating the content of the course, on the basis of the original simple graphics drawing of this course, the drawing of related practical application basic engineering drawings, such as electrical control map, PLC control map, and line operation map, are added. This is beneficial for students to recognize, draw and design actual engineering drawings, and purposefully cultivate students' practical engineering skills. Teachers simulate and arrange a specific project for teaching activities, through group cooperation, so that students can further learn the technical knowledge of engineering drawing in actual engineering drawings, strengthen the exploration desire and innovation spirit of Engineering drawings, stimulate the initiative and enthusiasm of learning, increase the practice opportunities of drawing, and improve the practical ability and thinking ability.

Taking the design of strong lighting engineering drawings for office buildings as an example, this paper uses AutoCAD2008 electrical software to complete the design of the plan construction drawings for strong lighting, including the calculation of relevant loads and illumination. Through the design of examples, students can understand the whole process of design better.

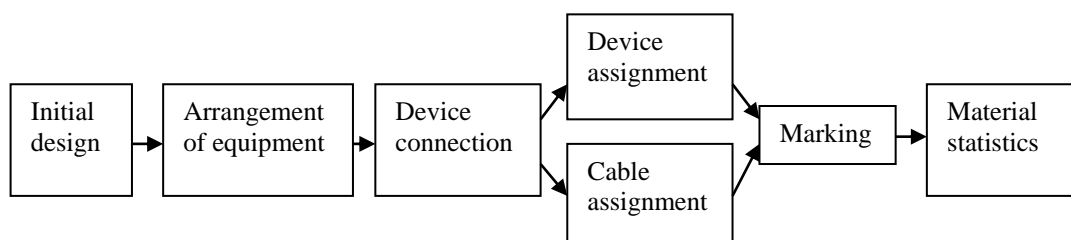


Fig. 1 Plane construction drawing design flow of intense electric lighting

The design of this case involves not only the basic software operation, but also the basic knowledge of reading and understanding the drawing. According to the actual requirements and combined with the national standards, it is necessary to complete the design of electrical lighting drawing, socket drawing, electrical system chart and legend equipment drawing, among which the lighting plan is shown as follows:

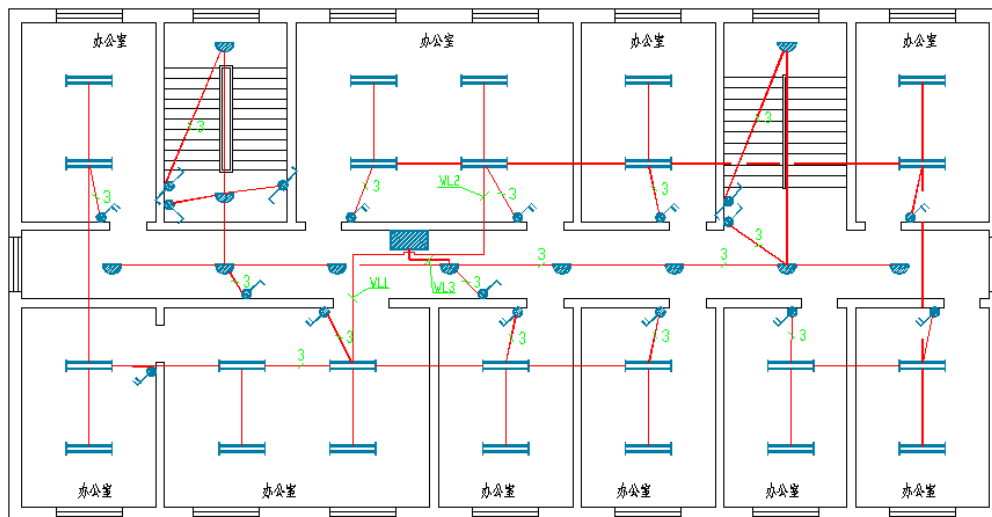


Fig. 2 Illumination plan

Through the analysis and drawing of practical cases, practicing the comprehensive skills of drawing recognition, reading and drawing, simulating the design of practical engineering drawings in an all-round way, cultivating students' ability to read and draw more complex electrical engineering drawings, enabling students to master the methods of drawing various electrical engineering drawings by using AutoCAD software skillfully, and having the feeling of becoming electrical design technicians, making full preparations for employment

4. Introduction of teaching methods for large and small projects

With the cooperation of school and enterprise, the combination of work and study as the platform, and case teaching as the way, we strive to build the curriculum of electrical CAD drafters. The teaching process requires teachers as the leading role, students as the main body, and it is completed in a new "project-based teaching" way. Before the reform, the project-based teaching was only to complete simple graphics drawing to achieve the learning goal of using CAD software. After reorganizing the course content, in the teaching process, the teaching project is taken as a typical practical engineering illustration, and the teaching mode of combining large project with small project is used to implement teaching. Within a semester, each group of students is required to complete a large project drawing or design - simulating a specific practical project, and at the same time arranging the corresponding small project exercises in each class - drawing typical electrical engineering drawings or simple graphics.

In the process of teaching implementation, all teaching tasks correspond to the key and difficult points of learning knowledge, and comprehensively learn the operation of CAD software and the experience method of practical engineering drawing. Students are required to complete specific operations according to task description. Big projects can be completed in groups, and can be completed together after class. It is convenient for learning process to discuss with each other, guide each other, make progress together, and cultivate the team spirit of students' work. Small projects must be completed independently in class, so that students can master classroom contents in time and use CAD software skillfully. Therefore, the teaching process must be completed in the computer room. It will form a whole of lectures, performances, studies, and exercises, and make full use of classroom time. In order for students to be able to control their own discipline of class, Teachers must reasonably arrange the amount of project content in the classroom, and require the completion of the project during the class as one of the basis for students' daily performance. At the same time, students are guaranteed to have proper practice time for hands-on operation, so as to maximize the teaching effect.

5. Reform of Assessment Method

For each course, a suitable assessment method must be established. Through the course assessment,

the students 'mastery of the course knowledge, the proficiency in the comprehensive use of the skills, and the ability to analyze and solve problems must be checked. Before the reform of this course teaching, the traditional examination method combining the usual grades with the final examination was adopted. In implementing the teaching reform of this course, in addition to the assessment of student attendance and classroom discipline, and the assessment of students 'normal performance, it is also necessary to pay attention to the students' learning and mastery and to assess the completion of various small projects in the classroom. At the same time, combined with the final completion of big projects and the final examination to give a comprehensive evaluation.

Obtaining vocational qualification certificates is an expression of professional ability, and the ability to obtain vocational qualification certificates often depends on whether the final theoretical examination and operational ability are met. In the course assessment mode reform, put forward the "curriculum certificate integration" teaching assessment method. The examination database is used as the content of the final exam, and it is also used as a pre-examination exercise for students to obtain vocational qualification skills cards, so that students are more confident that they can successfully obtain corresponding skills cards. Students 'research results are intended to be used as one of the basis for the evaluation of this course. Actively implement the "double certificate" system to make full preparations for students'employment. In the course of teaching, correctly guide students to professional knowledge and cultivate their professional interest, through the improvement of students 'self-career planning and ability requirements, stimulate students to learn the motivation of this course.

6. Conclusion

Electrical Engineering Drawing and CAD is a professional basic course for automation equipment, electrical automation, mechatronics and other specialties, as well as a compulsory course. This paper explores the teaching reform of "Engineering Drawing and Electrical CAD" from the aspects of course content, teaching methods, and assessment methods. The teaching practice proves that this reform has greatly improved the teaching quality of this course. Students are effectively improved to master the practical skills of electrical CAD, cultivate the comprehensive quality of students, improve the teaching level of teachers and enhance students 'ability to analyze and solve practical engineering technical problems.

References:

- [1] Chen Jiejun, Huo Lanyu. Analysis of the Teaching Reform of Electrical CAD Course in Higher Vocational Colleges [J]. *Economic and Trade Practice*, 2015, (7): 205.
- [2] Zhang Chundong, Li Lei. Study on the curriculum system of docking classes and integrating certificates [J]. *Northern Trade*, 2013, (5): 217.
- [3] Yin Mei. Teaching Reform and Innovation of Electrical CAD for Electronic Information Industry. *Journal of Xingtai Vocational and Technical College*, 2017 (05).
- [4] Fu Yaning, Tian Jinying. Auto CAD Electrical Engineering Drawing. Beijing: Beijing University of Posts and Telecommunications Press, 2013.08.
- [5] Yin Yujun. The influence of diversification of students in Higher Vocational Colleges on the teaching quality of course certificate integration and Its Countermeasures [J]. *New curriculum research*, 2017, (2): 19-21.
- [6] Liu Wei. Teaching Reform of Electrical CAD in Higher Vocational Colleges [J]. *Science and Technology and Innovation*, 2016 (24): 133.
- [7] Sun Wen Yao, Zhao Yi and Li Guang. Teaching Reform and Practice of Electrical CAD Course for Electric Power Industry [J]. *Vocational*, 2016 (14): 56-57.
- [8] GB/T 18135-2008 Electrical Engineering CAD Drawing Rules [S]. *Beijing: China Standard*

Press, 2008.

- [9] Liu Chengwei, Wenna, Wang Tao, etc. Employment-oriented teaching reform of electrical CAD course [J]. *Science and Technology Information*, 2013 (29): 199 + 201.
- [10] Yang Zheng. Teaching Reform of Electrical CAD Course in Higher Vocational Colleges [J]. *Journal of Yellow River Water Conservancy Vocational and Technical College*, 2010 (03): 58-60.