Based on the Big Data Analysis of the Task-Driven Teaching Model of Electronic Circuit CAD Teaching Content Planning

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Abstract. W In view of the problems and disadvantages of electronic circuit CAD in teaching mode, based on the circuit schematic diagram and PCB design tool Altium designer as the support platform, relying on the task driven teaching mode, the teaching objectives, corresponding teaching contents and specific tasks of electronic circuit CAD are planned, and the task driven method is adopted to mobilize students to actively learn electronic circuit CAD. The enthusiasm of the teachers has improved the malpractice of the students who did not study in the previous examination course, and achieved good teaching effect.

Keywords: Electronic circuit CAD · Task driven · Electrical schematic · PCB

1 Introduction

The basic guiding ideology of task driven teaching mode "task driven" teaching is the most fundamental "task as the main line, teachers as the leading, students as the main body", which is a kind of teaching mode based on constructivism learning theory.

Learning method, change the traditional teaching idea of imparting knowledge to the teaching idea of solving problems and completing tasks, change the "cramming" teaching mode to inquiry teaching, change the previous "teachers speak, students listen", change the passive teaching mode of teaching learning, change students into initiative, teachers as guidance. Students in the teacher's guidance, around some specific tasks and teaching activities, because students received a specific targeted teaching task, so in the problem motivation driven, students will actively carry out research or exploration, students received specific teaching tasks, targeted learning, in the learning process, through the completion of the task [1]. And problem solving, students will get the feeling of success, will stimulate students' desire for knowledge, and gradually form a virtuous circle of perceptual mental activities, which is conducive to cultivating students' self-learning ability of independent research and exploration.

2 Research Objective

Based on the teaching goal module of task driven teaching mode, planning the implementation of task driven teaching mode, the most important thing is the planning of

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teaching goal. According to the engineering education certification standard, determine the teaching goal of the course, and then according to the teaching goal, reasonably plan the teaching content, according to the teaching content, extract the specific teaching task. The teaching goal of electronic circuit CAD comes from two levels: one is to master the drawing of electrical schematic diagram, the other is to master the drawing of PCB; on the drawing level of electrical schematic diagram, we need to master the skills of adding component library, searching and placing components, editing and drawing; on the drawing level of PCB, we need to master the setting of circuit board layer, the layout of PCB, etc. Therefore, the teaching goal of electronic circuit CAD is to enable students to master the method of drawing circuit schematic diagram and printed circuit board diagram by using computer tool software [2]. According to this overall goal, three teaching modules are planned: basic skills of electrical schematic diagram drawing, basic skills of PCB drawing, and practical engineering case training. Among them, seven modules and PCB drawing are planned for basic skills of electrical schematic diagram drawing. Three modules are planned for drawing basic skills, and five modules are planned for practical engineering case training. The planned teaching module is shown in Fig. 1.

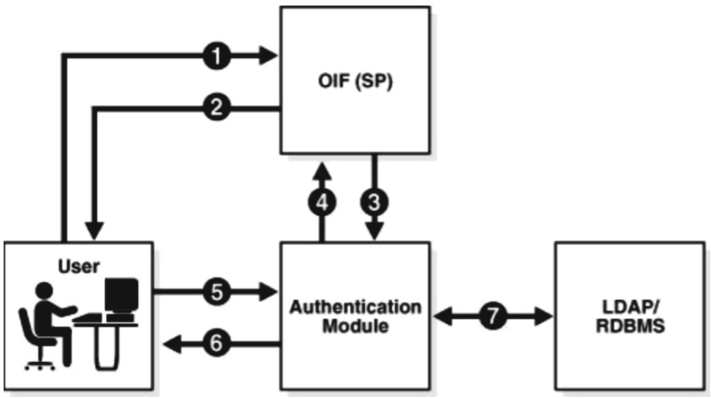

Fig. 1. Target module planning

3 The Planning of the Basic Skills Teaching Module of Electrical Schematic Drawing

This module mainly enables students to master the basic skills of electrical schematic drawing, and lays the foundation for students to draw electrical schematic diagram in the follow-up courses. It is divided into seven functional modules. The specific functional module planning is as follows: module 1: module 1. The teaching task is to enable students to master the engineering establishment, schematic diagram establishment, drawing attribute setting, drawing environment setting, viewfinder application and component library management based on engineering project management. The specific task flow is shown in Fig. 2.

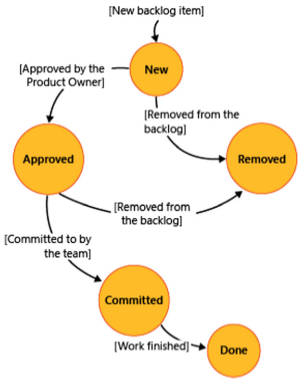

Fig. 2. Asks and processes

Module 2: the teaching task of module 2 is to enable students to master the component placement, component orientation adjustment, component removal, component attribute modification, wiring operation, electrical node placement, power and ground placement.

Module 3: the teaching task of module 3 is to make students master the bus placement, bus branch placement, network label placement, IO port placement and attribute modification, component model management, graphics and text addition and other methods by drawing the schematic diagram of AT89C51 and 2764 program memory expansion circuit.

Module 4: the teaching task of module 4 is to give a single tube AC signal amplification circuit, so that students can master the operation, editing and quick marking (selection) of single and multiple objects through the drawing of the schematic diagram. The editing skills include operation object, batch modification of device attributes, text information modification, automatic alignment of components and drawings, rapid drawing of multiple parallel lines, array pasting, system default settings, navigator use, automatic numbering of components, etc.

Module 5: the teaching task of this module is to enable students to master the editing and creation of electrical graphic symbols of components [3]. The specific task is to give a new package diode to enable students to master the starting operation method of schematic component library file editor, the modification operation skill of schematic component library file, and the Sch library panel. Use and modify the components in the schematic component library, batch update the components in the schematic, and create the schematic primitives.

Part library file, create component electrical graphics symbols, create schematic project component library. The modification of components in schematic component library includes two skills: one component modification and batch modification; there are four step-by-step tasks to create electrical graphic symbols of components, which are creating electrical graphic symbols of components from scratch, copying electrical graphic symbols of components from current library files (the premise is to open the existing schematic Component Library), copying electrical graphic symbols of components from existing library files, and making electrical graphic symbols containing multiple unit circuit components.

Module 6: through this module, students can master the concept and characteristics of multi-level circuit, the switching between different schematic files in the design of hierarchical circuit, and the editing method of hierarchical circuit. The specific task planning is to give two specific electrical schematic diagrams and draw hierarchical circuit on this basis.

Module 7: the teaching task of module 7 is to form the list of components on the basis of independently completing the electrical schematic diagram, and master the output and pasting skills of schematic report and file; the specific task planning is to draw the corresponding electrical schematic diagram based on the power circuit diagram. On this basis, master the device list of the schematic diagram, copy the schematic diagram (with template information) and report to word text, copy and paste only the selected part of the schematic diagram (without template information) to word textText, the operation method of adding the components or circuits in other engineering schematic diagram to the current design project, and the printing method of schematic diagram (using word document printing method and direct printing method).

4 PCB Drawing Teaching Module Planning

4.1 Main Process

This module mainly enables students to master PCB drawing and lay the foundation for students to participate in innovation training and research and development of electronic products.

Module 1: the task of module 1 is to master the creation of PCB file, the application of PCB editor interface and PCB editor interface, and the manual design of single panel method this task includes the setting of working layer, the method of manually adding board layer, the setting of visual grid, the setting of PCB environment, the loading of component packaging library, and the use of drawing tools (it includes component placement, pad placement, circuit board size setting, component serial number of silk screen layer and annotation information editing.

4.2 Part II

Module 2: the task of module 2 planning is to automatically draw PCB Based on power supply schematic diagram. Through this training, students can master the task PCB design process, preparation before PCB design, PCB layout, pad selection and wiring, ground wire/power line layout rules. Pad selection includes through element (THC). The routing tasks include parasitic parameters and crosstalk of printed wires, selection of minimum line width, selection of minimum wiring spacing, routing control of printed wires, setting principle of jumper in single panel, etc. the layout rules of ground wire/power wire include ground wire classification, common impedance interference and elimination of ground wire and power wire, grounding mode, and some basic principles of ground wire distribution and so on.

4.2.1 Specific Task Planning

The specific task planning is to give a new PCB packaging component, so that students can master the creation of component library file of PCB packaging drawing, create PCB packaging drawing of component in PCB library file, understand component management and maintenance of PCB packaging drawing library and 3D model addition. In order to create PCB package drawing component library file, we should master three methods: creating PCB package drawing component library file in user integration library file, creating PCB package drawing component library file in design project, and creating project PCB package drawing library; in order to create the PCB package drawings of components in the PCB package library file, we should master the following methods: creating the PCB package drawings of components manually in the PCB package library file, making the component package drawings by using the component wizard, making the surface mount component package drawings by using the IPC footprint wizard, and making the component package drawings by using the component copy function. Practical engineering case training task planning the main teaching task of this module is to enable students to master the basic skills of electrical schematic diagram and PCB drawing. Through this teaching module, students can master DC regulated power supply, minimum CPU system, single tube AC signal amplification circuit and AC contactless switch control circuit.

4.2.2 Practical Circuit Principle

Module 1 is the practical circuit schematic drawing, the training goal of this module is to complete the most systematic schematic drawing based on 89C51 single chip microcomputer, and the selected content is the drawing of the most systematic schematic circuit board based on 89C51 single chip microcomputer;

Module 2 is the drawing of circuit schematic diagram of self-made components. The training goal of this module is to complete the drawing of silicon controlled voltage regulating circuit based on 89C51 single chip microcomputer, which is divided into two specific tasks. Task 1 is to make electrical graphic symbols of light controlled silicon controlled moc3062 device, and task 2 is to complete the drawing of silicon controlled voltage regulating circuit based on 89C51 single chip microcomputer; Module 3 is the basic drawing of practical circuit PCB board. The training task of this module is to draw the PCB board of warning light, draw the electrical schematic diagram of warning light and PCB board drawing. The specific task includes two parts [4]. Task 1 is to draw the electrical schematic diagram of warning light, and task 2 is to complete the drawing of PCB board of warning light and give PCB Board size, power line width, signal line width, device packaging, etc.; Module 4 is the standard drawing of practical circuit PCB board. The main task is to draw the warning lamp electrical schematic diagram and PCB board based on 555 oscillator control. Three tasks are specifically planned. Task 1 is to draw the warning lamp electrical schematic diagram based on 555 oscillator control, and task 2 is to complete the drawing of warning lamp PCB board based on 555 oscillator control, and give PCB. The specific task is to form the width of the device line and the width of the signal line. Module 5 is practical circuit special structure PCB drawing, the main task of the module is to draw special structure PCB, specifically planning two

tasks, task 1 is to draw warning light electrical schematic based on 555 oscillator control, task 2 is to complete the drawing of warning light special structure PCB Based on 555 oscillator control.

5 Conclusion

Based on the planning of teaching objectives and teaching modules, teachers first assign teaching objectives and teaching tasks, and briefly explain the specific implementation methods and measures. Then students learn computer operation on their own initiative. Relying on the specific tasks given by teachers in each class, they carry out skill learning and research. Then teachers summarize, make the finishing point, and point out the students in the process of practice. Finally, students practice according to the teacher's skills, so that students can thoroughly grasp the teaching content and achieve the teaching objectives. After a semester of practical teaching, this teaching method has received good teaching effect.

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