The hierarchical teaching method exploration for curriculum design of photoelectric discipline

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ABSTRACT

This paper is mainly introducing the exploration of the hierarchical teaching method for curriculum design of photoelectric discipline. Due to the primal problems which extensively exist in current teaching on curriculum design practical course, some new suggestions are discussed in the aspects of teaching contents, experimental schemes, instruction modes and assessment methods. The curriculum design practical course should be updated with the professional hot spots. Combining the big class oriented instruction and group instruction, a hierarchical teaching mode is established, which implements layered training with a wide range for all students. With all of these efforts the teaching method of curriculum design practical course can be improved.

Keywords: hierarchical teaching; curriculum design; practical course

1. INTRODUCTION

Curriculum design practical course, as an important link in theory and practice, has a very close relationship to theoretical curriculum system, and which is the most effective way to cultivate students' practical ability and innovation ability. "Practice is the sole criterion for testing truth." Its significance and function are paid more and more attention. The traditional centralized practical course is the same in practical content for every student, the teaching time is fixed, the practical projects are old and obsolete, and the difference of individual students is obscured, which limits the cultivation of innovative thinking and the development of individuality. So the exploration of the hierarchical teaching method has attached great importance to curriculum design.

The 21st century is the century of light, photovoltaic industry has developed rapidly, especially photoelectric measurement, photoelectric equipment, photoelectric display, photovoltaic industry, and the demand for optoelectronic talent has increased dramatically. Optoelectronic specialty as our school focus on the construction of the discipline, the requirements of the comprehensive practical course must be different from other discipline, to highlight the combination of optoelectronics, to strengthen the measurement and application. However, the current photoelectric professional comprehensive practical courses, such as "photoelectric circuit design", teaching a single, teaching model is old, students get the training effect greatly reduced.

Domestic and abroad colleges and universities in improving the quality of practical teaching conducted a lot of attempts [1-6], have put forward the "task-driven" teaching method [1, 2] and "project teaching method" [3, 4]. There are some colleges and universities have begun to implement the tutor system [5, 6].

2. OBJECTIVES AND TEACHING MODEL

The goal of the hierarchical teaching method for curriculum design of photoelectric discipline is to enable students to apply the professional knowledge of the book to practice, to connect with practice, to increase sensibility, to understand the theoretical knowledge, at the same time it can exercise their practical ability and thinking ability to improve the ability in the course of practice and solve practical problems. So the curriculum design should be carried out around these goals. As an example, the photoelectric specialty of Institute of Optoelectronic Technology, China Jiliang University arranges two courses in the centralized practice, including "photoelectric circuit design" course, which is a compulsory course offered by students in the second semester of the third year after completing the course of "Circuit

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and Electronic Technology" and "Optoelectronic Detection Technology". The main purpose is to enable students to understand the photoelectricity Circuit design and production of the general process, to learn to use the basic optoelectronics and electronic devices, and to master the use of computer-aided software for circuit design skills. Another course of "Optoelectronic Intelligent Instrument Design" is a compulsory course for students who have completed the course of the "Single Chip Principle and Application" course. The main purpose is to enable students to obtain the basic ability of using knowledge they have learned to design optoelectronic intelligent instrument, which is to consolidate and expand the students' knowledge of hardware and software. These two practice courses are completed for three weeks, the main intention is to further improve the students' practical ability and to lay the foundation for the smooth development of graduation design. The hierarchical teaching method for curriculum design of photoelectric discipline is shown as Fig. 1. First of all, teachers should elaborate the teaching content to combine professional development focus and complete the task set. Combining the big class oriented instruction and group instruction, a hierarchical teaching mode is established, which set different topics of three-level difficulties from easy to hard. And then students choose topics and experimental design in literature research. An opening report will be presented, in order to examine the design level of students. The experiment can be carried out after passing through the opening report. There is a final report for the overall acceptance. All students will have a score after assessing their performance.

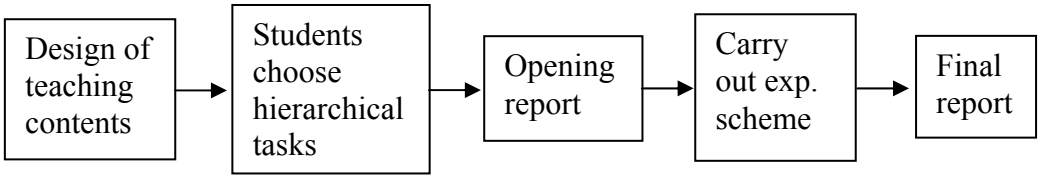

Fig.1 The hierarchical teaching method for curriculum design

3. HIERARCHICAL TEACHING METHODS

3.1 Teaching content

In the experimental course, the content of the pure theory is diluted while some examples of application, application prospects, technical knowledge to explain, and the practical and applied characteristics of practical courses are highlighted. Some of the latest advances in professional and practical application of the experimental content are added as far as possible focusing on training students' interest in learning. For photoelectric disciplines, curriculum design of teaching content should combine the development of photovoltaic industry status, such as free space optical communications, 3-D laser imaging, photovoltaic cell, LED illumination, etc. Some of the new experimental content is set to stimulate students' interest in learning and explore it. For example, the content of optical simulation can be added to the practice course. A simulation of the optical fiber coupler with Rsoft is depicted in Fig. 2.

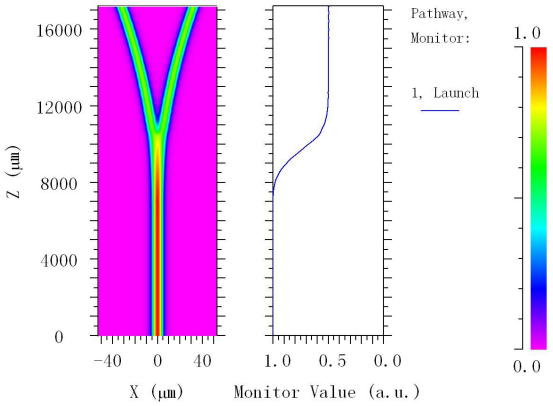

Fig.2 Simulation of the optical coupler with Rsoft

Different colors represent intensity of light propagating in fiber core. About 50% energy of the fiber core get into another fiber after the branch point. The simulation can complement the lacks of the experiments in some way. In short, the

teaching content should highlight the characteristics of optoelectronic discipline. It cannot blindly engage in the old routines of electronic circuit production. The annual content of practical course is updated with the current professional hotspots. The update of the teaching content which means higher requirements put forward for teachers. Teachers are required to pay more attention to the hot spots of industrial development and turn the latest scientific research achievements into teaching resources.

3.2 Experimental program

It's mainly to change the experimental program all in the same key before, and avoid following the prescribed order mechanically to achieve each student programs are not the same, which give full play to students' initiative. The feasibility of the experimental program is the core of hierarchical teaching for curriculum design. So it is necessary to pay attention to it. Curriculum design of photoelectric discipline emphasizes the design, rather than the simple validation of the experiment. It is a key criterion to evaluate the level of students' experiment that it is feasible to put forward a feasible experiment scheme. We can take a task-driven method. Each task can be used to achieve a different experimental program. For example, the design of an LED indoor shadowless lamp, the experimental program can be arranged in LED ring, which can also be used in square or triangular arrangement, eight-shaped arrangement. As long as the purpose can be achieved, the program students proposed should not be put too many restrictions on, so that students can give full play to personality and imagination. Teachers should be strict about this process and resolutely avoid plagiarism.

3.3 Guidance

Previously, the curriculum design of photoelectric discipline was mainly carried out by two teachers. But because of the large number of students, each student had little chance of getting teacher guidance. Many students have problems which cannot be solved in time; teachers are busy and cannot take into account. Therefore, we draw lessons from the current domestic and foreign university of hierarchical teaching method. The instructor is made up of all the teachers of the whole discipline. The number of students per teacher in the control of less than 5, so that teachers and students are more relaxed in time to ensure the effectiveness of teaching practice. The experimental site and the schedule are based on the mode of open experiment project. There are two large general laboratories, which can accommodate two classes at the same time experimental production. Experimental equipments include monolithic integrated circuit, oscilloscope, multimeter, power source, photoelectric sensors, and commonly used electronic devices and so on. Students can enter the laboratory opened more than 10 hours a day in two weeks to make experiment. In this way, almost every student can solve their problems in time, and the effect of instruction is much higher than before.

3.4 Assessment methods

The experimental report should not be the only criterion for measuring students' academic performance. The standard of student achievement should pay more attention to the ability to be appraised. The grades of curriculum design should be a comprehensive reflection of its various abilities, such as self-learning ability, verbal ability, hands-on production ability, innovation ability and cooperation ability. We should increase the proportion of the scoring of the program design in order to make the evaluation more effective, more comprehensive, more accurate evaluation of the practical ability of students, and promote the improvement of students' practical ability and the cultivation of the spirit of innovation. We divide the total score of students into four parts: scheme design, experiment operation, writing report, and reply report. The final total score is based on the sun of these four parts' scores. In this way, students attach great importance to every aspect, and achieve the goal of cultivating students' comprehensive ability through practical teaching.

4. CONCLUSION

Through the hierarchical teaching method exploration for curriculum design of photoelectric discipline, we gain a new teaching mode of practical course, which create a good teaching atmosphere, and fully mobilize the enthusiasm of the students. Under the guidance of teachers, analysis and discussion with students, students are changed from passive acceptance of knowledge into active exploration of knowledge. It makes practical course becoming a bridge between theory and practice. Students' ability of active learning is cultivated, which embodies the role of teachers' guiding and students' learning autonomy. In short, colleges and universities should organize to grasp the hierarchical teaching method, which carry out various forms of reform through multi channels and multi levels, and cultivate students' comprehensive ability in practice.

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