

## Exploring the Practical Teaching Mode of Software Engineering Courses

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**Abstract.** With the continuous development and expansion of the modern information industry, the software industry has become more and more important as its basic component. The "Software Engineering" course is a course that studies the development of large-scale software systems under the guidance of engineering theories, methods and techniques, and occupies a central position in the field of computer software. Practicality is the core feature of the course. The existing practice links adopt the "one step-by-step, one-size-fits-all" teaching method, ignoring the individual differences of different students and combating the enthusiasm and creativity of students. Therefore, combined with the "software engineering" teaching reform The project proposes a hierarchical case-based teaching model. Practice shows that the hierarchical case-based teaching mode effectively stimulates students' interest in the "software engineering" practical class and significantly improves the teaching quality of the "software engineering" practical course.

### Introduction

In recent years, the employment situation of software engineering students to various IT enterprises is good. However, the employment quality and employment rate of software engineering professionals have been declining year by year, and the quality and quantity of IT enterprises' demand for software talents has been continuously improved. This has become a common problem in the training of software professionals in local universities and the development of IT industry in China. . On the one hand, most of the software engineering professionals trained in colleges and universities cannot adapt to the actual needs of IT enterprises; on the other hand, the traditional school-enterprise cooperation or the combination of engineering and learning is often affected by various factors and it is difficult to get real implementation or acquisition. <sup>[1-3]</sup> Therefore, relevant universities and institutions at home and abroad have made a lot of explorations and attempts on how to effectively improve the quality of training and employment competitiveness of software engineering professionals. Developed countries such as the United States and the United Kingdom have explored the "cooperative education" model in this area and have been effectively implemented in more than 200,000 undergraduates at more than 1,000 universities. This model is actually a talent training model that combines school-enterprise cooperation and work-study. China has also carried out the exploration and practice of software engineering professional talent training mode <sup>[4]</sup>. The software engineering major is a technology-based discipline. Practice teaching is an important way to cultivate college students' practical ability, engineering ability and innovation ability. For this reason, it is aimed at the cultivation of software engineering professionals and the demand of IT enterprises for such talents. The contradiction exists, strengthening the cultivation of innovative practice ability of college students majoring in software engineering and improving the level of practical teaching is the key to solving this problem. "Software Engineering" is an important professional compulsory course in computer and related majors. It is a course to guide the development and maintenance of computer software. In addition to studying computer software itself, software engineering involves many other fields, such as management science, psychology, economics, etc., and plays an important role in today's information society. Practice teaching is an important part of the "software engineering" course, which is directly related to the improvement of students' comprehensive quality, as well as the cultivation of innovation consciousness and innovation ability. Compared with other curriculum practices, the "software engineering" practice has the characteristics of high comprehensiveness and systemicity, which is also the difficulty of

teaching. How to really do a good job in the "software engineering" practice link is a topic that all software engineering educators must seriously study. This paper proposes a "software engineering" practical teaching model based on hierarchical cases, and has achieved success in practical teaching.

### **The Status of "Software Engineering" Practical Course Teaching**

At present, most of the "software engineering" practical teaching in colleges and universities is carried out according to the unified requirements of the subject syllabus, mainly adopting the teaching method of "step by step, one size fits all". However, Dalian Jiaotong University (hereinafter referred to as "our school") software college has a more uneven phenomenon of students' computer knowledge and learning ability. In the combination of dual majors, some professional students position their future in the computer. Related industries, so the computer level is high, the subjective willingness to learn computer courses is very strong; however, at the same time, some professional students also position their future in another major of dual majors, such as: machinery, measurement and control, marketing, accounting. The attitude of this part of the students to computer-related courses is "small tastes," the subjective will is not strong, and the computer foundation is also poor. In addition, some of them are confused about the future, and there is no accurate positioning.<sup>[5]</sup> They often show no sense in their studies. status. This kind of phenomenon will inevitably require the corresponding reform and innovation of "software engineering" practical teaching, correctly understand the individual differences of students, and truly solve the phenomenon that students "eat not enough", "eat bad", "can't eat", and maintain Learning the interest of students with good foundations gives students the confidence to learn from poor students, so that all students can get the development that suits them. Combining the characteristics of the dual-professional combination of students in our School of Software and the actual situation of students, we believe that it is necessary to implement "level teaching" according to the actual level of students in the software engineering practice, which is to improve the practical ability of students in software engineering. It is of utmost importance to cultivate software engineering talents with engineering capabilities and application capabilities.

### **Professional Curriculum Practice Teaching Mode**

In the traditional professional course teaching, the teaching process is generally divided into two parts: classroom teaching and course practice. The teaching plan completes the classroom teaching and then organizes the course experiments. For example, for the 56-hour database principle and application course teaching, the teacher first explains the 40-time database principle knowledge, database analysis and design methods, database basic application and other textbook knowledge content in the classroom; after the classroom teaching, organize students to conduct 16 Class time course experiments, complete some database system basic operation experiments, such as database basic SQL operation experiments, database management experiments.

It can be seen from the above that the traditional curriculum practice teaching is only a course experiment, and the practical activities are roughly the experimental teachers guiding the students to complete a number of basic course experiment, the student completes the experiment report, and then the experiment teacher gives the evaluation result according to the course experiment report submitted by the student. This kind of professional curriculum practice teaching mode is simple to implement, easy to operate, and has certain training for students' practical ability. However, this practical teaching mode is not enough for the practical practice of database professional course teaching.

Table 1 Practical teaching content arrangement

Number	Content	Class Hour
1	Proposition, organize research groups, identify topics	2
2	demand analysis	6
3	Building an object model	8
4	Building a dynamic model	8
5	Building a functional model	8

After in-depth study of this course practice teaching mode, we found a phenomenon: many students in the classroom, although they understand the course knowledge content, but also understand some basic database operations, but in the course experiment can only complete some basic design experiments.<sup>[5]</sup> For some database integrated design and application programming problems, students feel difficult to practice, but do not know how to solve some engineering problems. Analysis of the reasons, we believe that the traditional curriculum practice teaching model has the following problems: 1 the course practice teaching less, only through the course experiment training students professional skills and engineering practice ability obviously can not meet the requirements of the engineer's potential ability training; 2 classroom teaching and curriculum Independent experiment, lack of organic connection between curriculum theory knowledge and practical operation; 3Because before the course experiment, students do not have the necessary operation foundation, and in a limited time, usually only some basic experiments can be completed, so it is difficult to combine engineering application scenarios. Solve the actual engineering problems, let alone cultivate the ability of innovative thinking in the course experiment. The evaluation of the practical ability of the practical teaching mode is limited to the review results of the experimental report, and it is difficult to fully reflect the training effect of the students' practical ability. Some students plagiarize the experimental report, and the evaluation will lose its meaning.

Therefore, the traditional professional curriculum practice teaching mode is not suitable for cultivating outstanding engineers, and it is necessary to adopt a more appropriate one. The curriculum practice teaching mode cultivates students' professional skills, engineering practice ability and innovative thinking ability.

### Improvement of the Practical Teaching Mode of Professional Courses

From the above analysis of the practical teaching mode of traditional professional courses, the professional curriculum practice teaching for excellence plans needs to have one novel teaching model. Drawing on the CDIO engineering education thought <sup>[7]</sup>, we propose a curriculum practice teaching model for the cultivation of engineers' core potential ability, as shown in Figure 1.

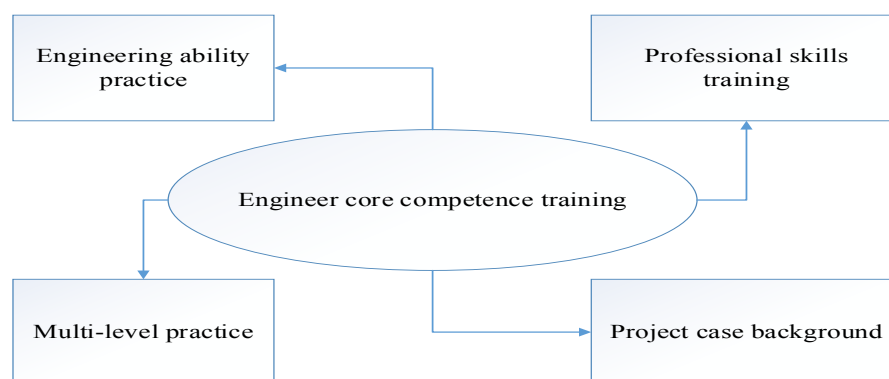


Figure 1 Curriculum Practice Teaching Model for the Cultivation of Engineers' Core Potential Ability

Specifically, in the practical teaching of database courses, the core potential of software engineers under the curriculum (professional skills). The objectives of energy, engineering practice

ability and innovative thinking ability are to carry out the professional skills training and engineering ability practice training of database system development in the context of engineering case projects. The course teaching process organization is no longer simply divided into classroom teaching and course experiment, but the core competence of the database course is integrated into the classroom teaching, practical operation, course experiment, curriculum design and other aspects, and integrated Level ability training.<sup>[5]</sup> In addition, students' database project team collaboration and communication skills and design innovation capabilities are developed through a comprehensive project curriculum design.

### Database Curriculum Practice Teaching Mode Implementation Plan

The practical teaching of the database course in the software engineering major of the University of Electronic Science and Technology of China applies the above-mentioned new professional course practice teaching mode. Focus on the training of software engineer database capabilities in all aspects of curriculum practice teaching. The specific implementation plan of the database course practice teaching is shown in Figure 2.

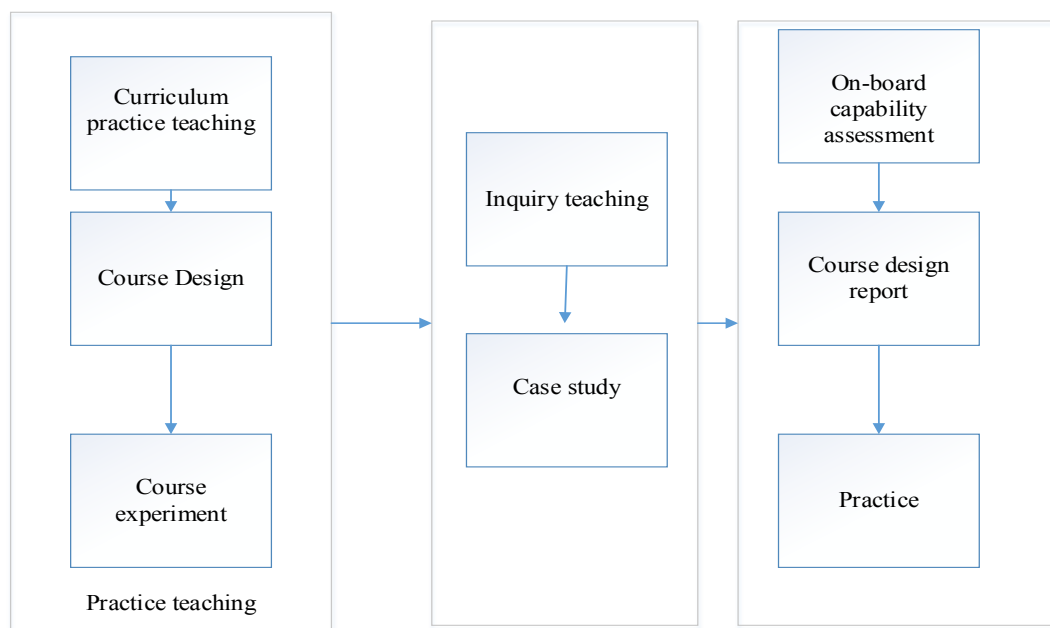


Figure. 2 Database curriculum practice teaching implementation plan

#### 1) Course practice teaching.

The course teaching practice of the database course is divided into 40 hours of classroom practice teaching, 16 hours of course experiment, 24 hours of course design, and the sub-level curriculum practice through the integration of "in-class practice → after-school practice → course experiment → comprehensive course design" Training, training students to have the ability to "conceive - design - implementation - operation" database. At the same time, through the group of comprehensive curriculum design project practice, to develop students' team communication skills, collaboration capabilities and engineering system practice capabilities.<sup>[6]</sup> Under the integrated curriculum practice teaching system, unified planning the potential ability of each link to cultivate goals and practice teaching content, to ensure the cohesiveness of the practical content of each link.

#### 2) Course practice teaching methods.

In the database classroom practice teaching, the teaching methods of doing middle school, case teaching and inquiry teaching are adopted for different thematic chapters. In the course teaching of the relational model in Chapter 2, the inquiry teaching method and the case teaching method are used to explain the use of the relational model in the database, how to represent the system data relationship, how to standardize the relational model, how to solve the engineering application problem, and how to solve the engineering application problem. In the experimental teaching of

database course, the project task-driven method is used to decompose a project instance project into multiple experimental topics, and guide students to complete the development of an actual database application system project. For example, for the book lending management system project, students are required to complete the SQL Server database software installation and configuration, the book lending management system conceptual data model design, the book lending management system physical data model design, SQL Server system management and database implementation, and the book lending management. System Web database access programming and other subject experiments.

In the course design teaching of the database, organize a group of teachers to guide students to carry out course design and ensure the courses of each group of students. The design topics are different. Course design topics are geared to practical application needs and address several engineering issues. For example, a typical course design topic is the Auto 4S Store Member Management System, the International Conference Submission System, and the Student Apartment Management System. In the process of course design, the instructor guides students to apply database theory knowledge, professional technical methods, product development tools to complete a database application system development, and gives the development report and software works of the corresponding process, and also requires students to work together. To develop students' ability to communicate, communicate and collaborate in database application development.

#### **Evaluation of Curriculum Practice Teaching.**

The evaluation of the practical teaching of the database course consists of the usual practice, the curriculum design report, and the evaluation of the ability of the machine. Practice teaching

In the model reform implementation plan, the students are subjected to practical teaching assessment according to the database engineer's database ability goal and focus on the student's ability to conduct the actual measurement, so that the curriculum practice teaching evaluation can objectively and truly reflect the improvement of the student database capacity. At the same time, through evaluation methods, students are guided to pay more attention to the cultivation of core potential.

#### **Conclusions**

A good course requires a modern teaching method that adapts to the characteristics of the course and a strict assessment method. Need a good syllabus, a high-level teaching team, a scientific and reasonable teaching plan. Teaching practice is a creative process that brings hope and strength to teachers and enables teachers to maintain a long-lasting passion for teaching. The basic idea of the professional curriculum teaching mode is to focus on the training potential of the engineer's potential ability, and to carry out the professional skills training and engineering practice ability training for the core potential ability of the engineer in the professional curriculum with the engineering case project as the background. This model is applied to the teaching methods of middle school, project case study and inquiry teaching, so that the core competence of outstanding engineers such as professional skills, engineering practice ability and innovation ability is fully cultivated. The practical teaching mode of this course is suitable for the training of excellent engineers, and it has certain reference significance for the practical teaching of similar courses.

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