

# Database Course Teaching Reform Plan Based on CDIO

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**Abstract:** Database system principles and applications "is an important basic course for computer majors in vocational colleges, with strong theoretical and practical significance. To meet the requirements of professional training, the article analyzes the positioning and teaching content of the course "principles and applications of database systems". By combining the CDIO-OBE concept with course practice, not only can students proficiently master the basic knowledge points related to databases, but also avoid the boring psychology of students caused by dry teaching methods. Through project decomposition, team collaboration, online discussions, and micro classes, the theoretical and practical teaching links have been closely combined, improving the current experimental teaching system, and promoting the improvement of the experimental teaching level of this course.

**Keywords:** Database Course, Reform Plan, CDIO

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## 1. INTRODUCTION

The course 'Principles and Applications of Database Systems' is an important foundational course for computer majors in vocational colleges, and it is also the core course of our system maintenance major. Through the study and practice of this course, students should be able to understand the basic concepts and principles of relational databases, flexibly apply SQL Server database management systems and the design and development of relational database systems and have the ability to develop database information systems. However, there are still problems in the teaching of the course "Principles and Applications of Database Systems", such as a relatively single teaching form and incomplete evaluation of teaching effectiveness. Therefore, it is necessary to introduce the CDIO and OBE concepts in this course.

As a teaching-oriented university of finance and economics, our school has been offering Access database application courses among all non-computer major students since 2009. Through experimental courses, students can better understand the basic theories and knowledge points of databases, master the methods of creating and using access databases, and lay a good foundation for them to pass the computer level exam (Level 2 exam access database subject). However, in the actual teaching process, the author found that students generally lack the engineering thinking ability to analyze and solve problems.

For this reason, we have introduced the successful CDIO education model in the field of engineering teaching in database experimental teaching. By combining the existing Blackboard online teaching platform in the school, we aim to improve students' database application abilities through database project conceptualization, decomposition, collaboration, online discussions, and micro classes. The CDIO engineering education model is the latest achievement of international engineering education reform in recent years and has become a universal model for international engineering education. The CDIO engineering education model is a concentrated summary and abstract expression of "learning by doing" and "project-based education and learning". It takes the lifecycle of products from research and development to operation as the carrier, allowing students to learn engineering in a proactive, practical, and organic way between courses. It cultivates students' engineering skills, professional ethics, academic knowledge, problem-solving

ability, lifelong learning ability, and teamwork ability to communicate and control large systems.

Taking our system maintenance major as an example, the course "database system principles and applications" is a compulsory course offered in the first semester of our sophomore year, with 64 class hours. This course mainly cultivates students' ability to manage and apply relational databases, as well as their ability to develop database application systems in combination with advanced programming languages such as JAVA. The leading courses of this course are "fundamentals of computer applications" and "fundamentals of computer programming", and the subsequent courses are "jsp dynamic website construction". The comprehensive experiment involves designing a small database system project.

## 2. THE PROPOSED METHODOLOGY

### 2.1 CDIO teaching philosophy and OBE teaching philosophy.

According to the characteristics of students in different majors, team up students to participate in a small project. Cultivate students' teamwork, communication and coordination skills, technological innovation, design and development abilities, problem-solving and problem-solving abilities in the project development process, and achieve "learning by doing". For example, a library management system can be divided into four parts: system analysis and design, database design, window design for each functional module, and integrated database system. When grouping projects, we can break down each step into multiple sub projects for different students to complete. Classroom teaching is the first stage of the entire database course teaching. We will permeate cases into every stage of classroom teaching, explain basic knowledge points based on the traditional student course selection database, and then combine the design and development of the "graduation project management system" used in practice to explain the application of knowledge points in practice.

These knowledge points include conceptual model design, standard SQL, normalization theory, database design, database programming, and transaction related content. At the same time, group teaching mode is adopted. Before the start of the course teaching, students are grouped according to the standard of 3-5 people, and each group is assigned different projects, which are sourced from the project case library.

Vocational college students have weak theoretical foundations and strong hands-on practical abilities. Although the course 'Principles and Applications of Database Systems' requires students to hands-on practice, it is not as easy to operate and has a strong visual impact as courses such as 'Graphic Design' and 'FLASH Animation Production', which can greatly stimulate students' interest in hands-on practice. The course 'principles and applications of database systems' requires a certain amount of knowledge accumulation before hands-on practice, especially for the basic knowledge in the early stage, such as databases, database systems, data tables, E-R diagrams, transact-sql language basics, etc. Each knowledge point is interconnected and closely linked, requiring students to proficiently master it.

However, the repeated emphasis on key points by teachers can easily make students feel the dryness of theoretical knowledge, resulting in a lack of understanding of basic knowledge in the past and a failure to practice in the future. Therefore, in line with the CDIO concept, we have changed the theoretical class hours to 18, and the computer practice class hours to 36. We have also changed the class location from a regular multimedia classroom to an experimental teaching center computer room, where teaching and practice can be conducted simultaneously. Students can practice immediately after listening to the teacher's theoretical explanation and can keep up with the teacher's teaching thinking and have enough time to independently think and practice, avoiding the situation of disconnection between the class content and the computer experiment. The experimental content and course design content conducted by each group are related to the assigned projects, and they are different from each other. The experiments are divided into validation experiments and comprehensive design experiments.

The specific process is as follows: Firstly, the teacher releases task requirements, allowing students to first understand the task objectives completed by the project and understand the implementation ideas based on the objectives. Observe the performance of each student throughout the entire semester, including learning attitude, work and professional ethics, teamwork spirit, communication and expression abilities, and organizational and coordination abilities, and conduct a professional ability assessment. Based on the projects made in the course design, the project assessment scores are given. These two items account for 70% of the total assessment score in the regular exam, and 30% of the total assessment score in the final exam. This provides the overall evaluation or overall assessment score of the students.

## 2.2 Construction of Database Practice Teaching System Based on CDIO

The former involves the basic knowledge of knowledge points, so each member of the group is required to complete it independently; The latter is the comprehensive application of the learned knowledge points, so team members need to work together under the coordination of the team leader. To avoid duplication in experimental and course design content, we will combine the final comprehensive design experiment with course design. At the end of the course, we will complete the database design and implement the specific functions of the system in the course design starting from the next semester.

This can achieve an organic combination of experiments and course design. The course 'principles and applications of database systems' is guided by the obe concept when setting teaching objectives, which can effectively evaluate teaching outcomes. The objectives of this course mainly include two

aspects: ability objectives and quality objectives. Among them, the ability objectives mainly include that according to the requirements of the talent position, students should be able to install, debug, and maintain SQL Server databases; Design the database according to project requirements; Writing and debugging relevant Transact-SQL statement codes; To improve students' learning efficiency, we have also introduced popular micro lesson videos on the Blackboard platform to achieve data integrity through constraints, indexing, and other means.

In specific teaching, the content taught in micro courses is in a "point" shape and fragmented. These knowledge points can be knowledge interpretation, problem exploration, and key point induction; It can also be a knowledge explanation and demonstration of skills such as method teaching and teaching experience. It is short and powerful, able to meet students' learning needs anytime and anywhere, and fully utilizes students' leisure time, allowing them to use fragmented time to grow knowledge. As mentioned earlier, each group is assigned corresponding projects and then divided into groups for homework, experiments, and course design. The smooth implementation of these measures has put forward strict requirements for teachers. Each teacher needs to be very clear about the overall situation of each project, and plan the homework content, experimental content, and course design content for each project at each knowledge point before teaching.

In practice, we build these contents into a case library and enrich the accumulated new cases into the case library at the end of each semester. The acquisition of new cases in the case library mainly comes from students' practical training projects, teachers' own projects, and simulation projects of cooperative enterprises. Design stage: this stage is based on the results of the conceptual stage and adopts modular thinking to design the "product sales database" conceived. The design process includes the requirements of the product sales database, the E-R diagram design of the database, the storage capacity and location of the database, and the design index. This stage is conducted through grouping, with 4-6 students in each group and one group leader for each group.

## 3. CONCLUSION

Integrating the CDIO-OBE concept into the teaching of "Database System Principles and Applications" not only enables students to proficiently master the basic knowledge points related to databases, but also avoids boring teaching methods that may cause students to become bored with the course. Improved students' ability to think systematically and independently solve problems. The experimental course of this course has become a national planning textbook for general higher education due to its effective use. At the same time, based on the BB network teaching platform currently used by our school, we have also made some beneficial attempts. Based on integrating online teaching resources, new methods such as mobile learning are used to deepen students' understanding of teaching content, stimulate their interest in self-directed learning, and cultivate excellent talents with solid theoretical and practical abilities.

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