Research on the Design and Implementation of Case Teaching in MySQL Database Course

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Abstract: With the rapid development of information technology, the demand for data processing and data storage in all walks of life is increasing. MySQL, as an open-source relational database management system, has been widely used in various application systems because of its high performance, high reliability, and ease of use. This paper aims to discuss the design and implementation of case teaching in the MySQL database course, and improve students' understanding of the theoretical knowledge of MySQL database and practical ability through specific case analysis. Through the design of a series of cases related to actual business scenarios, combined with theoretical teaching and practical operation, students can master the basic operation of MySQL database, data query and analysis, and data security and protection skills.

Keywords: MySQL database; Case teaching; Teaching design; Implementation research

1. Introduction

As an open-source relational database management system, MySQL has been widely used because of its stable performance and easy operation. In higher education, the MySQL database course is one of the important courses for computer science and technology, software engineering, and other majors. However, the traditional teaching methods often focus on the imparting of theoretical knowledge and neglect the cultivation of students' practical ability. As an effective teaching method, case teaching enables students to learn and master knowledge in the process of solving practical problems by simulating real business scenarios. Therefore, based on the basic idea of case teaching, this paper designs and implements a series of MySQL database teaching cases to improve the teaching effect and cultivate students' practical ability and innovative thinking.

MySQL database is an open-source relational database management system, developed by the Swedish company MySQL AB, which was acquired by Sun Microsystems, and now belongs to Oracle Corporation [1]. MySQL database with its complete support system, high security, usually deployed in a server, performance is very high, single-node or cluster system environment [2], in the Web application, data analysis, and other fields have been widely used [3].

2. Case teaching method

The application of case teaching in database courses has received some attention and research. Many scholars and educators devote themselves to exploring how to improve students' practical ability and comprehensive quality through case teaching. Domestic research emphasizes that case teaching should closely combine theoretical knowledge with practical operation, so that students can deepen their understanding and application of knowledge through case practice while learning theoretical knowledge [4]. Some scholars devote themselves to developing case resources suitable for database courses, including simulated cases and real cases. These case resources are designed to provide students with rich practical opportunities to help them better master database skills. Domestic research has also explored the specific application methods of case teaching in database courses, such as group discussion, project practice, role playing, etc. [5] These methods aim to stimulate students' interest and enthusiasm in learning and improve their learning results.

Although the current research on database case teaching has achieved some results, there are still some shortcomings: (1) the quality of case resources is uneven, and it is difficult to meet the teaching needs. This may cause students to encounter difficulties in the practice process and affect their learning effect [6]; (2) the lack of innovation in teaching methods leads students to feel dull and boring in the learning process, reducing their interest and enthusiasm in learning; (3) the combination of theory and practice is not close [7], which may make it difficult for students to apply theoretical knowledge to practical scenarios in the practice process, affecting the improvement of their practical ability and comprehensive quality; (4) Existing studies often focus on case teaching methods and effect evaluation, but the comprehensive evaluation of students' practical ability is still insufficient. This may lead to teachers being unable to accurately understand the actual level of students, so it is difficult to formulate targeted teaching strategies [8].

3. Case teaching design and implementation

3.1. Teaching objectives

MySQL database as a professional core course of computer science and technology, software engineering and other majors, after in-depth investigation of enterprises, talent needs, to find out the actual employment of graduates, its quality objectives are determined as follows: Cultivate good logical thinking ability and practical ability, have a certain independent learning of new knowledge, new technology learning ability and teamwork ability, can guarantee the quality and quantity to complete the learning task, work task, train some suitable for social needs, and have a certain practical ability and innovation database social talents[9]; the knowledge goal is to master the basic knowledge of database design, master the development and management technology of MySQL database, be familiar with the development process of database system, and be able to complete the design, creation, development, inquiry and maintenance of database system according to the requirements; the ability goal is to be able to realize data definition, data manipulation and data maintenance through SQL statements and database management interface, and to establish simple stored procedures to realize data management. Case teaching plays an important role in achieving these goals.

3.2. Teaching content

The case teaching of MySQL database designed in this paper includes the following aspects:

(1) Basic concepts and basic operations, mainly including database installation and configuration, database, table, field creation and management, data types and constraints, data insertion, update and deletion;

(2) Data query and analysis, mainly including single table query, multi-table query, classification summary and sorting;

(3) Data security and protection, mainly including user rights management, data backup and recovery, data encryption and decryption;

(4) Database design and optimization, mainly including the conceptual model design of the database, logical structure design, physical structure design and performance optimization and adjustment.

3.3. Case teaching design and implementation

3.3.1. Case 1: Database design of student information management system

(1) Case background: A college needs to develop a student information management system, which is used to manage students' basic information, course scores, reward and punishment records, etc. It is required to design an efficient, stable and safe database system to meet the needs of data processing in the daily operation of the school.

(2) Teaching objectives: to master the conceptual model design method of database; Learn to create database, table and field, and set constraints; Understand and master the basic operations of data insertion, update, and deletion.

(3) Implementation steps:

(A) Demand analysis: Analyze the business needs of the student information management system, determine the data entity and its relationship.

(B) Conceptual design: design the conceptual model of the database, including entity identification, relationship definition, etc.

(C) Logical design: design the logical structure of the database according to the conceptual model, create data tables and fields, and set constraints.

(D) Physical design: design the physical structure of the database, including storage strategy, data backup and recovery.

(E) Implementation and testing: Create data tables in the MySQL database, and insert test data for functional testing and performance testing.

(4) Case results:

(A) Students apply the theoretical knowledge of database design to the actual student information management system, and deepen their understanding of theoretical knowledge through practice. At the same time, students have a deep understanding of the core concepts and principles of database design through practical operations such as designing database tables, establishing relationships, and setting constraints.

(B) By guiding students to analyze practical cases, the teacher deepened the students' understanding of the complexity and importance of database design.

(C) Students need to work in groups to complete the task together in the process of case teaching. Through teamwork, students learn how to communicate, coordinate, and cooperate with others, and improve their teamwork ability.

(D) In the design process, students need to face various challenges and problems. Through independent thinking and teachers' guidance, students learn how to use innovative thinking to solve problems and cultivate innovative and problem-solving abilities.

(E) Students need to make project plans, assign tasks, monitor progress, etc., and cultivate the ability of

project management and time management.

3.3.2. Case 2: Database security and protection

(1) Case background: An enterprise database stores a large amount of sensitive data, including customer information and financial information. It is required to design a database system that can guarantee data security and protection to prevent data leakage and illegal access [11].

(2) Teaching objectives: Master the basic methods of user rights management; Learn to use encryption to protect sensitive data; And understand and master the basic methods of data backup and recovery.

(3) Implementation steps:

(A) User rights management: Create user accounts and set different user rights to ensure that users can only access the data within their rights.

(B) Data encryption: Use encryption technology to protect sensitive data, such as customer information, financial information, etc.

(C) Data backup and recovery: Develop a data backup strategy to ensure that data can be quickly recovered in the event of a failure.

(D) Security test: simulate illegal access and data leakage to test the security performance of the database.

(4) Case results: Through this case, the students have successfully designed and implemented a database system that can guarantee data security and protection, mastered the basic methods of user rights management, data encryption and data backup and recovery, improved the database security protection ability, and made remarkable achievements in case teaching using data security and protection. These achievements are not only reflected in the students' mastery of data security skills, but also in the enhancement of their awareness of data security, the cultivation of team cooperation and communication skills, the enhancement of case analysis and problem-solving abilities, and the formulation and implementation of data security policies. These achievements have laid a solid foundation for the students' future work and life, and also provided a strong guarantee for the organization's data security

4. Evaluation of teaching effectiveness

Teaching effectiveness evaluation is an important link to ensure the quality of teaching and the effectiveness of students' learning. To evaluate the effect of case teaching design and implementation, this paper adopts four methods [12]: questionnaire survey, achievement analysis, interview and observation and record. The questionnaire survey is mainly aimed at the students' satisfaction, knowledge mastery and ability improvement of case teaching [13]. Achievement analysis evaluates the influence of case teaching on students' learning effect by comparing the change in students' achievement before and after case teaching. Interviews are conducted face-to-face or online with students to gain an in-depth understanding of students' learning experience and feelings, as well as their views and suggestions on case teaching [14]. Observation and recording refer to teachers observing students' learning performance in the teaching process and recording students' learning process and learning outcomes as the basis for evaluation.

The results of the questionnaire survey show that most students are satisfied with the case teaching, believing that the case teaching can help them better understand and master the knowledge and skills of the MySQL database [15]. At the same time, the students generally think that the case teaching improves their practical ability and innovative thinking, but some students suggest that the difficulty of the case is sometimes too high or too low, and it needs to be closer to their learning level and actual needs.

The results of performance analysis show that the students' performance after case teaching is significantly higher than that before case teaching. Especially in data query and analysis, data security and protection and other aspects of performance improvement are particularly significant. This shows that case teaching has an obvious promoting effect on improving students' learning.

5. Conclusion and prospect

5.1. Conclusion

Through designing and implementing a series of MySQL database case teaching, this paper discusses the application and effect of case teaching in the MySQL database course. The results show that case teaching can significantly improve students' learning interest and practical ability, and promote students' understanding and mastery of MySQL database knowledge and skills. At the same time, case teaching also cultivates students' innovative thinking and problem-solving ability. Through well-designed cases, students can not only intuitively grasp the basic operation and advanced functions of the database, such as the creation of data tables, the writing of query statements, the use of indexes, etc., but also exercise the ability of problem-solving and teamwork in practice. Case teaching makes the abstract database principles vivid and concrete, helping students better understand the logic of database design and the complexity of database management. At the same time, this teaching method also stimulates students' interest in learning, enabling them to constantly challenge themselves and improve their professional quality in the process of solving practical problems. In a word, the application of the case teaching method in database teaching not only improves students' learning efficiency but also lays a solid foundation for their future career development.

5.2. Prospect

In the future, we will continue to deepen the application and research of case teaching in MySQL database courses, and constantly optimize and improve the design and implementation methods of case teaching. In the future, case teaching will pay more attention to the timeliness and practicality of the content, and introduce the latest database technology and management concepts to ensure that what students learn is closely connected with the actual needs. At the same time, teaching methods will be more flexible and diversified, and digital tools and platforms [14,15] will be used to create a learning environment combining online and offline to enhance students' learning experience and interactivity. In addition, case teaching will also strengthen the cross-integration with other disciplines, cultivate students' interdisciplinary literacy and innovation ability, and lay a solid foundation for them to become high-quality database talents adapting to future social development.

Disclosure statement

The authors declare no conflict of interest.

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