Application Research of Project-based Teaching Based on Working Process in Oracle Database Teaching

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Abstract. This paper combines the design and development of student management system and integrates project-based teaching based on working process into the course of Oracle database technology. It guided by the working process and regarding the project as the carrier, and in accordance with the principle of "task-driven, practice-connected, work-integrated and strengthening ability", combing the online and offline teaching integrates with "teaching, learning and doing", fully arouses students' learning enthusiasm and initiative, and enhances their comprehensive ability and sustainable development ability.

Keywords: Based on working process, Project teaching, The Oracle database

1. Teaching status of Oracle database technology course

Oracle database technology is a highly practical course, which aims to make students understand the basic process of database design, master the installation and configuration of Oracle, be familiar with the use of SQL statements, be competent for the management and maintenance of Oracle database, cultivate students' ability to apply Oracle database technology to solve practical problems, and lay a good foundation for the subsequent database design and software development.

At present, there are some problems in Oracle database course teaching in higher vocational colleges. Such as the emphasis on theory and the neglect of practice, the preference of practice teaching to the verification of knowledge, the single teaching method, etc. It is difficult to stimulate students' interest in learning, and students' ability to design and develop database system is relatively weak. They lack the ability to solve problems independently, and they cannot adapt to the needs of practical work. Therefore, the teaching reform of highlighting the cultivation of professional ability in the teaching of Oracle database technology is imperative.

2. The theoretical basis of project-based teaching based on working process

PBL is a teaching activity with students as the main body and teachers as the leading part, which is carried out through the joint implementation of a complete work project. It drives the teaching with the project, and the whole process of completing a project is actually the process of students' mastering knowledge and transforming skills[1].
Project-based teaching based on working process refers to teaching with working process as the teaching process, emphasizing the connection between teaching process and actual working process, and the connection between teaching environment and working environment. The project task carrier of "combining work with study" is used to lead classroom teaching, cultivate students' learning interest, stimulate their creativity and innovation ability, and enable students to use their brains as well as their hands in the learning process, so that they can master knowledge in practice, cultivate their ability in practice and improve their quality in practice[2].

Students of higher vocational colleges lack learning foundations and understanding abilities, and their independence, autonomy and exploration of learning need to be strengthened. Meanwhile, they have active thoughts and strong operational ability, and are more willing to acquire relevant knowledge by completing specific tasks in practical operation. Therefore, the project-based teaching model based on the working process is more in line with the current situation of higher vocational students, which is also conducive to the docking with the job, as well as in line with the goal of vocational education talent training, and is also a trend of the reform and development of vocational and technical education teaching.

3. Design idea of project teaching method based on working process

3.1. Working process as the guide, project as the carrier and reasonable arrangement of teaching content

Database application system is developed according to the life cycle method, and its working process can be divided into six stages: requirement analysis → conceptual structure design → logical structure design → physical design → database implementation → database operation and maintenance.

In view of the above working process, the author selected the project of "student management system" as the carrier to design and arrange the teaching content, and transformed the real work task in the development of student management system into a learning task suitable for teaching. Through the deconstruction and reconstruction of the work task, it became a teaching task that can be implemented in class. The task design of "student management system" based on working process is shown in Table 1.

| Serial number | Task | Related knowledge | Ability training |
|---------------|------|------------------|-----------------|
| 1             | Analyze and design the database of student management system | Demand analysis; Conceptual design, to find out the entities in the system, various attributes of the entities, the relationship between entities and using Visio2010 to draw E-R diagram; Logical design, convert E-R diagram into two-dimensional table. | Develop students' ability to extract information from requirements and design databases. |
| 2             | Install and configure Oracle | Installation and configuration of Oracle; Start and access Oracle database server; Application of common management tools OEM and SQL*Plus for Oracle database; Uninstall Oracle from the registry. | Cultivate students' ability of self-study and practical operation. |
| 3             | Create the database and data of the student management system | Create the database; Create table Spaces; Create, modify and delete all data tables in the student management system; Define the data type of the field; Define various constraints. | Cultivate students' operational skills, logical thinking ability and cooperative ability. |
| 4             | Update the data of | Add department information, class | Cultivate students' |

Table 1. Task design of student management system based on working process
|  | the student management system | information, teacher information, student information, course information, performance information, teaching tasks, etc.; Modify department information, class information, teacher information, student information, course information, performance information, teaching tasks, etc.; Delete data. | learning ability and practical operation ability. |
|---|---|---|---|
| 5 | Query the data of student management system | Query the partial columns, partial rows and expressions table; Conditional query; Data sorting; Group query; Join queries and sub-queries. | Cultivate students’ learning ability and practical operation ability. |
| 6 | Create and maintain the users of student management system | Create and modify users; Grant and revoke user privileges; Create and modify roles; Grant and revoke role permissions. | Train students to use technical means to solve practical problems. |
| 7 | Backup and restore the data of the student management system | Export data using the EXPDP command; Import data using the IMPDP command; Back up the table space using the Rman command; Restore the table space using the Rman command. | Train students to use technical means to solve practical problems. |

**Teaching preparation**

**Task arrangement**
- Task import
- Task analysis

**Demonstration guide**

**Task implementation**
- Independent exploration
- Group discussion
- Team collaboration

**Summary evaluation**

**Task development**

*Figure 1. Implementation steps of project teaching based on work process*
3.2. Task-driven and six-step teaching
With the project of "student management system" as the carrier, the task of project development is decomposed into several progressive work tasks. Each task is organically integrated with the explanation of knowledge points and skills training, which is integrating "teaching, learning and doing" into one. The students are gradually guided to master various technologies of Oracle database development and application by completing one task after another.

The implementation steps of project teaching based on working process are shown in Figure.1.

3.3. Create a student-centered, online and offline teaching approach
Teaching reform needs to change from "teacher-centered" to "student-centered". In order to realize this change, we must strengthen the integration of teaching and learning and increase the form of the integration of teaching and learning. With the help of the online learning platform of Oracle database technology, an online and offline teaching method is created. Before class, students can learn independently through the learning task list, micro-video, courseware and other teaching resources of the online learning platform. In class, teachers introduce teaching with learning situations close to their places, and stimulate students' interest in learning by means of task-driven, interactive discussion and role play, so as to give full play to students' subjective initiative. After class, students can further internalize their knowledge through summary and analysis and task expansion.

4. The practice of project teaching method based on working process in Oracle database teaching
In order to understand the teaching practice of Oracle database technology more intuitively, the author selected task 1 "analysis and design of the database of the student management system" as the sample for presentation analysis.

4.1. Teaching preparation
The teacher will upload the learning task list, micro-video, PPT, test question bank, training manual and other teaching resources to the online learning platform in advance. The students, combing their own learning needs with the learning tasks, watched the teaching resources uploaded by the teacher in their extracurricular self-study time, completed the pre-class exercise tasks required by the teacher, clarified the functional requirements of the student management system, and got familiar with the implementation method of database design. At the same time, they communicated with teachers and classmates synchronously or asynchronously and completed the task of independent learning before class with the help of the learning communication platform.

4.2. Task arrangement
Based on the workflow of the student management system, the teacher proposes the specific tasks need to be completed, specifies the specific requirements for completing the tasks, and lets the students understand what to do and what results to achieve, so as to complete the tasks more effectively.

Task import: we should analyze the requirements of the student management system and draw the functional structure diagram. According to the demand analysis of the student management system, we should construct the E-R diagram of the student management system and convert the E-R diagram to a data table.

Task analysis: When drawing the functional structure diagram, it should be combined with the requirements of school administration, departments, teachers and students. When constructing the E-R diagram, the local E-R diagram is firstly constructed and then merged into the global E-R diagram[3]. When converting an E-R diagram to a table, we should determine the primary table name in the database and define the columns of the table, including column name, data type, length and whether they are null, and identify the primary and foreign keys of each table.
4.3. Demonstration guide
The teacher answers the difficult questions in class and demonstrates the operation.

For example, when transforming E-R diagram of student entities into data table, the relational model of some groups transforming is as follows:

Student (student number, name, gender, age, date of birth, date of admission, date of graduation, department code, class code, contact information)

Teacher demonstration and guidance: According to the requirements of the first paradigm (1NF), each field of a table can contain only one non-resolvable atomic value. Among them, the contact information cannot combine the phone, address and postcode data into one column. The solution is to set the phone, address and postcode three columns in the student information table and save the three parts of data respectively.

4.4. Task implementation
Combine the assigned tasks, divide the students into groups, and complete the tasks through independent exploration and teamwork.

The teacher divides the students into groups, which is four in a group and one as the group leader and three as the group members. They work together to analyze the needs of students, teachers and administrators, as well as to construct E-R diagrams and transform data tables.

4.5. Summary and evaluation
Each group reports the completion of the task, and the teacher shows the excellent works and makes a summary of the completed teaching activities, so that the quality of teaching can be promoted.

The teacher organizes the student make the report of analyzing and designing the database of the student management system with PPT, and displays the completion process of the plan. Through PPT report, the teacher and the students can check whether the connection between each entity in the E-R diagram of each group and the attributes on the connection are correct; Check whether the method of converting E-R diagram into the logical form of data table is reasonable; and Check whether the primary and foreign keys of each data table are correctly identified, etc. By means of group self-evaluation, inter-group mutual evaluation and teachers' comments, they can make comments on the common problems and representative individual cases in the operation process, and analyze the problems, give correct operation methods and steps, and ask students to clarify the operation points to avoid the same problems.[4]

4.6. Task extension
In the task extension stage, teacher assigns learning tasks to expand knowledge and skills and supplement knowledge and skills not acquired in teaching.

In the task expansion stage of analyzing and designing the database of the student management system, the teacher assigns "age and date of birth fields in the student information table of some students' conversion, should they be retained? Why?", "the score information table converted by some students without the primary key, what problems will cause? How to solve it?" Students are required to analyze and discuss the extended tasks, and share the solution ideas and operation steps on the stage.

5. Conclusion
This paper combined with the typical project of designing and developing student management system, integrates project-based teaching based on working process into the course of Oracle database technology. From the design of teaching content to the implementation of teaching, it embodies the idea of taking the ability promotion as the standard and the skill training as the main line. It is guided by the working process and carried out in the form of project-based teaching. The design of project task is from easy to difficult, and the teaching implementation level is progressive, online and offline mixed teaching methods are combined. It fully stimulates students' learning enthusiasm and initiative,
enhances students' comprehensive ability and sustainable development ability.

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