Reform and Exploration of Database Principle Course Based on OBE Learning Outcome-oriented

Wei Gu

College of Information Technology, Shanghai Jian Qiao University, Shanghai, 201319, China

Email: guwdx@126.com

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Abstract: Nowadays, as there is a disconnection between theory and practice in the course of database theory and according the OBE education model, a student-centered, learning-oriented, and sustainable improvement teaching model was established in the database theory course. The expected learning objectives of the course are formulated according professional competence requirements. The teaching content is determined and the teaching methods are improved according the expected goals, to design quantified process evaluation criteria and analyze the degree of achievement of goals based on the evaluation results. Emphasis is on the goal of driving student learning outcomes. The courses are conducted to enhance students' professional practice ability, engineering ability and innovation ability.

1. Introduction

At present, all colleges and universities are advocating new engineering education, and are putting more and more emphasis on the cultivation of students' practical ability. For application-oriented colleges and universities, how to focus on the practical application of students' ability in curriculum design and teaching is particularly important. The “Database Theory” course is a professional basic required course for all majors of computer science. It plays a very important role in the professional foundation. This course integrates theory, operability and practicality. And it has many points of knowledge and practical features. It not only requires students to be able to understand the basic theory in the database, but also use theoretical knowledge to solve practical problems. How to train students' comprehensive quality (basic theory, professional skills, teamwork ability, comprehensive problem and solving ability, etc.) in the teaching process of this course has become a problem for the database course team [1].

The OBE education model is an educational concept of international advanced engineering education. Its core philosophy is to focus on student-centered, outcome-oriented education and continuous improvement in the quality of education, thereby cultivating students' practical application capabilities [2]. Based on studying the OBE education concept, the author introduces it into the “Database Principles” course. Firstly, the teaching content is determined according the expected ability goal and the determination of the expected goal of the course. And the teaching design, the teaching plan, the teaching method and the design evaluation are planned. The teaching program ultimately aims to promote students’ comprehensive ability training.

2. Course Status Analysis

The teaching goal of the “Database Principles” course is to cultivate database application talents who acquire the basic theoretical knowledge and professional skills of database application system design and development, and at the same time have a certain comprehensive quality, able to think about and solve various problems encountered in the system design and development process. At present, in the teaching of database courses, most teachers are used to teaching students by giving lectures while students have little interests. Classroom teaching is mainly taught by teachers, students are passively accepted, and students' initiative is not fully utilized. The enthusiasm of them

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is not high. Secondly, during the teaching process, the emphasis is placed on the teaching of knowledge points. There is a disconnect between practice and theory. Students cannot master the combination of theory and practice and have poor hands-on ability. The cultivation of students' abilities is neglected. What's more, the assessment method is relatively simple. It can neither fully test the effectiveness of learning nor the mastery of student ability. The assessment can't detect whether to achieve the expected goal of the course. Therefore, how to reform and design the course of database theory, take students as the center to cultivate their practical application ability and promote the development of the curriculum is a problem that needs careful study.

3. Design of Database course based on Learning Outcomes-oriented

Focusing on the current status of the database theory curriculum and training of the ability of students, the author's teaching team introduced the OBE education concept in this course. OBE (Outcomes-based Education) is a structural model that organizes, implements, and evaluates education based on expected learning outcomes (outputs) [2]. It is a student-centered model and a learning outcome-oriented model. In the traditional teaching, the teaching content exists and occupies the core position instead of the teaching goal. In the OBE education model, the teaching is guided by the outcome, the target (student expected learning outcome) exists instead of the teaching content, and the curriculum resources are developed. Activities such as student management and coaching must be conducted around the desired goals. Therefore, in the OBE education model, students truly become the center of teaching activities, which means that the students become the main body, which helps to stimulate their interests in learning and increase their initiative in learning. This model is a change for the traditional teaching model, which is product-oriented. It combines the theory and practice, cultivate the students' ability, and ultimately evaluate whether the expected goal is reached in order to test whether the students really master knowledge.

3.1 Professional skills, course expectations and course content design

In the OBE education model, firstly, we must develop the expected objectives of the curriculum. The formulation of the expected objectives of the curriculum should correspond to the professional competence requirements. According the requirements of the professional graduation ability, we should formulate the expected goals of the relevant courses, and then determine the teaching content according the expected objectives of the curriculum. To achieve curriculum content, etc., we must focus on the expected goals. The author has taken the software engineering major as an example. By analyzing the requirements for graduation ability of the major, and then combing through the knowledge content of the course content, it is determined that the main capability goals of the database principle course including: database design capability, database implementation capability, data manipulation capability, and database management and maintenance capabilities, database system development capabilities. According these abilities, the expected learning objectives of the course are determined. The expected goals are corresponding to the course knowledge modules, and the knowledge points of the modules are differentiated step by step. Each knowledge point has clear requirements and reflects the knowledge system centering on the expected goals. Specific professional competence requirements, course expectations, and division of curriculum level teaching content are shown in Table 1.

According the OBE education philosophy, the teaching process is aimed to develop the achieving of the ability. Therefore, to better train students' abilities in the teaching process and inspire students' interest in learning, theoretical teaching is organized in a project-driven manner to cultivate students' database design and application capabilities. According the database design process, there will be 6 major modules such as curriculum database basic knowledge, database design process, database implementation, data manipulation, database application, data management and maintenance. Heuristic and interactive teaching methods (such as classroom tests, random questions, etc.) are used in the specific teaching process to motivate students to actively participate in classroom learning so that students can intuitively and quickly understand relevant theories and guide students to become passive learning as active learning. Improve classroom

learning.

Table 1 List of expected courses and teaching contents

Course Objectives (Expecting Learning Outcomes)	Related Major Level 1 Knowledge Points	In-class Experiment Content
Database design based on information description	1. Database basic theory 2. Relational data model features 3. Database modeling theory and database design methods 4. Database standardized design	1. Database design experiment
DBMS can be used to create and use databases and tables	1. Installation and use of related DBMS 2 database and table creation 3. Data integrity constraints	1.Build a development environment 2. DBMS use 3. Database creation
Ability to perform related operations on data in the database	1.SQL language basis 2. Relational algebra 3.DDL application 4.DML application	1.SQL database to create a database 2. Data query 3. Data addition, deletion and modification
Database security management and maintenance	1. Database user security management 2. Data backup and restore 3. Things and Concurrency Control	1. Database Backup and Restore 2. User Management
Database programming and system development combined with language	1. Stored process applications 2. Trigger application 3. Data Access Technology *4. System Development Implementation	1. Use of stored procedures and triggers 2. Data access implementation

3.2 Combining theory with practice, combining classroom and extracurricular activities to develop students' abilities and comprehensive qualities

In the teaching process of the principle of the database, the theoretical and practical operation can’t often correspond. In the OBE education model, based on the learning effects of students, firstly emphasis on theory, followed by the strengthening of the practice, to enhance the students' abilities based on this. According this design idea, in the course content design, the knowledge link between the three is organically combined to achieve a combination of theory and practice. The specific contents of the three are shown in Figure 1. In terms of teaching methods, the teaching management system is firstly applied throughout the entire teaching, combining theoretical and practical cases, with teachers as the main body, students participating in the way, through the teaching case to clarify the complete work process. Based on this, it allows the students to choose a project design. And developments are carried out so as to realize self-learning ability and reach the goal of combination of theory and practice. In the experiment link, arrange the practice link that suits the goal of the course, adjust the experiment content according the teaching content of the module. Experiments were divided into in-class experiments, autonomous experiments, and free experiments. In-class experiments require students to complete in the classroom according the teacher's knowledge. Autonomous experiments require students to independently select relevant tools according the experimental content. For example, the database design part requires students to select database modeling tools for database design, complete the data flow diagram design of the specified system, and design the ER model. Free experiment means that qualified students make use of self-repairing time on their own, and through independent learning resources, conduct independent experiments on other mainstream DBMSs. It helps to form a combination of in-class learning and autonomous learning to achieve the needs of student differentiation.

3.3 Process assessment based on quantitative standards, comprehensive assessment of learning results

The teaching under the OBE education model is mainly reflected in the obtaining of the students' abilities. It is impossible to complete a student's overall measurement with only one exam paper. With the support of the OBE concept, this teaching reform will change the assessment method from singleness to diversity. Focusing only on whether the student has really achieved some of the competencies or not, the assessment is divided into four parts: the usual grades (20%), the on-machine tests (20%), the unit tests (20%) and the final exam (60%). Among them, the usual achievements include classroom performance, extracurricular assignments, and experimental results. Each section uses quantitative indicators as far as possible to evaluate and improve the credibility and effectiveness of evaluation. Specific evaluation indicators are shown in Table 2.

Table 2 Quantitative evaluation indicators for normal performance

Evaluation Content	Evaluation Index (percentage)
Classroom performance (20% of the usual scores)	1. Positively answer questions, complete all tasks in class, and actively expand knowledge 90-100 2. All tasks in class are completed. Answer questions generally 80-90 3, classwork is completed, less interaction 65-80 4. Incomplete work in class, no interaction 0-65
Extracurricular work and practice (30% of the usual scores)	1. Actively use the online platform to download relevant teaching resources and obtain certain experience values (according to the blue ink statistics, the experience value is above 30), and can submit assignments on time and take the initiative to study extracurricular knowledge. 95-100 2, can download the relevant teaching resources, and obtain the experience value (experience value in [20-30]), and can submit assignments as required, learning extracurricular knowledge 80-95 3, can download the relevant teaching resources, and obtain the experience value (empirical value in [10-20]), complete the job 70-85 4, can download the relevant teaching resources, and obtain the empirical value (experience value in [5,10]), submit part of the job 60-70 5, no experience, the job is not good 0-59
The experiment on the machine (accounting for 50% of the usual results)	1. The experiment was completed, the experimental process and results were all correct, and the experiment was completed in a complete, 90-100 points. 2. All experiments were completed. There were a few errors in the experimental process and results. The experimental summary was completed. 80-90 points. 3, the experiment is completed, there are some errors in the experimental process, the experiment is summarized, 70-80 points 4. The experiment is completed, the experiment process is wrong, the experiment is concluded without, or rarely 60-70 5. The experiment failed to be completed completely. There are many errors in the experimental process. There is no experimental summary. 0-60 points (according to actual circumstances)

4. Implementation effect analysis

4.1 Analysis of achievement of course objectives

According the OBE teaching model, it is necessary to analyze the achievement degree of the students mastering the course objectives so as to judge whether the students have achieved the expected learning objectives of the course. The author analyzes the target achievement of the students from 2016 grades class 1 in the software engineering major, and design achievement degree analysis quantitative index. The scores of each part of the student's evaluation are analyzed

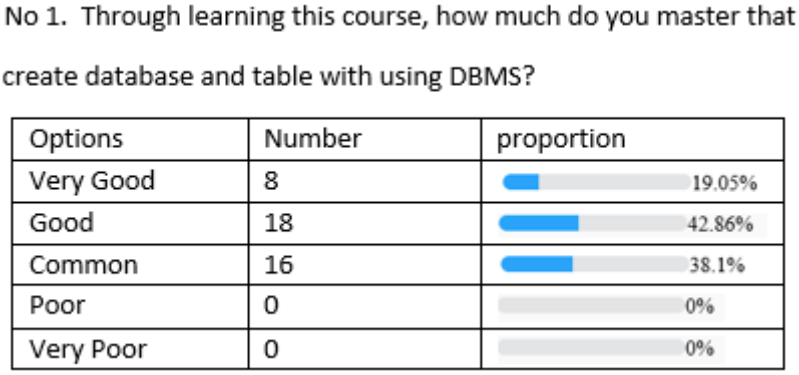
to determine whether each goal meets the requirements. For example, if the target of the course can be used to create and use databases and tables using the DBMS as an example, whether to achieve this goal or not is evaluated. All evaluations are performed. The content of the indicator related to the target needs to be evaluated. For example, a total of 6 points for the first question in the final exam is related to the target, and the average score for the student is 3, then the degree of achievement is 4/6. =0.67, and the proportion at the end of the period accounts for 40%. Then the achievement of the goal in the final exam is 0.67*0.4. Finally, all the ratios add up. If the achievement degree is 0.7 (the score of the school degree certification course is more than 70 points), you can determine that it meet the target requirements. The specific evaluation design is shown in Table 3. If there is a target of the course that does not reach the target of 0.7, then it is considered that the expectation has not been completed. And it is necessary to further analyze the reasons. It should be considered whether the expected target is set too high, or the teaching methods need to be improved, etc. It is also advocated by the OBE teaching model to improve in the future teaching and carry out continuous development.

Table 3 Analysis of achievement of course objectives

Course objectives	Supporting evidence 1		Supporting evidence 2		Supporting evidence 3		Supporting evidence 4		Degree of achievement of course objectives (>0.7 pass)
	Final Exam 40%	Achieved Degree	Unit Test 20%	Achieved Degree	Computerized Test20%	achievement level	20% Usual grades 20%	achievement level	
DBMS can be used to create and use the database and table	1. The first question (20%) [points 6 points]	4/6=0.67	1. The first topic (10%) [3 points] 2.The third big question [20 points]	1. 18/23=0.78	1. The first big question [20 points]	14/20=0.7	1. 20%	0.85	0.67*0.4+ 0.78*0.2+ 0.7*0.2+ 0.85*0.2= 0.734 >0.7 Complete the course objectives

4.2 Student Satisfaction Analysis

While quantitatively analyzing the expected accomplishment of the course, it is also possible to survey whether the student himself believes that he or she meets the objectives of the course. Through a combination of quantitative and qualitative methods, the degree of accomplishment of the course goal can be comprehensively assessed. Take goal achievement questionnaire of the students from software engineering grade 2016 class 1 as examples. The specific questionnaire design is shown in Figure 1.


No 1. Through learning this course, how much do you master that

create database and table with using DBMS?

Options	Number	proportion
Very Good	8	19.05%
Good	18	42.86%
Common	16	38.1%
Poor	0	0%
Very Poor	0	0%

Figure 1 Student Goal Achieved Questionnaire Survey

5. Conclusion

Through the teaching practice, this study examined the implementation effect of the OBE education philosophy in the database theory curriculum. The students used to be puzzled, confused, and passively learned when they learned the database theory curriculum at first. They gradually changed to a state of clear goals, active participation, and active learning. In the questionnaire survey, 23.2% of students said that the model has made great progress after learning, 63.4% of students think that they have made greater progress, and the remaining 14.4% of students think that they have made slight progress [3].

The initial success of the practice results shows that under the guidance of the OBE education concept, with the students as the main body and with the learning effect as the direction and continuous improvement as the driving force, the database theory teaching reform has deepened students' understanding of theoretical knowledge, improved the achievement of students' ability, and trained students' hands-on ability to apply theoretical knowledge flexibly into practice.

The problem that is reflected in practice is that due to the frequent interaction between teachers and students, the workload of teachers is large. When the number of students reaches a certain level, the monitoring of students by the teachers will be very difficult. The improvement will be made in the future teaching research.

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