Reform of Database and Data Warehouse Based on OBE Model

Xiaoyan Zhang [1,a *], Yao Li [1,b], Chuanlin Huang [1,c] and Zhiqi Guo [1,d]

[1]Department of Information Management and Information System Dalian Neusoft University of Information Dalian 116026, China

[a] zhangxiaoyan@neusoft.edu.cn; [b] liyao@neusoft.edu.cn;
[c] huangchuanlin@neusoft.edu.cn; [d] guozhiqi@neusoft.edu.cn

Keywords: OBE; Database and Data warehouse; Teaching reform; Result orientation.

Abstract. Database and Data Warehouse is a new cross-course derived from Database Principles course in the era of big data. Firstly, the paper puts forward the urgency of learning database and data warehouse for students majoring in information management at present; secondly, it analyses a series of problems in the traditional teaching of Database Principles, such as teachers teach based on teaching content, adopting indoctrination teaching method, students' poor initiative, simple and single evaluation of learning effect; finally, it adopts OBE's result-oriented and student-centered teaching reform model, explores and practices the reform steps of result orientation for Database and Data warehouse course.

Background of Starting Database and Data Warehouse

Database correlated curriculums at traditional university are mainly about Database Principles or Database Applications, aiming at cultivating students' comprehensive ability of database theory and practice, helping students to establish preliminary concepts of software engineering. With the rapid development of information technology, the application of database is getting deeper and deeper. In the era of big data, data shows a big explosion. How to timely find useful information from the sea of data has become a difficult problem. In the field of informatization, more than 90% software systems need the support of database or data warehouse. Therefore, Database and Data warehouse has a particularly important position in the undergraduate education major of information management, is the basis of the follow-up course learning and plays an important role in the personnel training [1]. Based on this, our university starts Database and Data warehouse course for undergraduates majoring in information management, aiming at cultivating students' understanding, analysis and design abilities of database and data warehouse, as well as their development and application abilities of database and data warehouse [2]. Database and Data Warehouse involves the basic principle and concept of database and data warehouse [3], requirements analysis of database and data warehouse, E-R modeling, relational database modeling, standardization design of database, SQL, design and construction technology of data warehouse, OLAP etc.

Current Situation of Correlated Curriculums in Domestic University

In order to further compare the current situation of database correlated curriculums, teachers investigate several domestic universities, by careful analyses, find the current teaching situation is that teachers explain the theoretical knowledge of database and data warehouse in class, experiments instructions are set in advance, and students complete experiments in accordance with the operation instructions, and finally accept learning outcomes by examination. This kind of teaching mode aims at teachers' accomplishment of teaching contents. All students study the course according to the prescribed schedule and unified requirements. There are several problems as follows:

  DOI: 10.25236/icess.2019.091

Teaching is Teacher-Centered, and the Teaching Objective Fails to Guide the Teaching Content.

Through investigation, it is found that at present, the teaching of database correlated curriculums in university is teacher-centered, and the setting of teaching objectives is based on the teaching tasks of teachers, which has no guiding effect on the teaching content, and the teaching content is prior to the teaching objectives. The course covers basic knowledge of database and data warehouse, database modeling technology, business knowledge related to database system, SQL, advanced applications etc. The teaching did not start from the needs of students, and the class hour was limited, so the lecture could not cover all aspects. Students could not easily grasp the main line of the course, thus led to the unsatisfactory final assessment effect. Some students could not apply the database knowledge they learned to subsequent learning and practical projects.

Teachers have a Single Classroom Organization, Students have a Single Learning Style.

Through investigation, it is found that at present, the classroom organization of database correlated curriculums in university is mainly based on teaching the theories and methods, interspersed with the introduction of database application, in-class experiments and classroom questions.

Students mainly listen to the teacher, lack of information search, network learning and other independent learning methods, aren't interested in the experiment and theoretical application. Their initiative is not strong, after-class learning time is insufficient, so teaching effect is affected.

Due to the lack of interaction and communication between teachers and students, teachers fail to pay attention to the feedback of theoretical tests and experiments in class and timely adjust the requirements on students to encourage them appropriately so as to stimulate their learning potential.

Do not Attach Importance to the Evaluation of Teaching Effect.

At present, the database correlated curriculums in our school are mainly assessed by the usual homework and the final closed-book examination. Most of the examinations are based on the memory of knowledge.

Teaching evaluation is only from the passing rate, excellent rate and exam difficulty and other aspects. The evaluation content is too single, lacks of detailed evaluation standards, unable to effectively assess the realization of teaching objectives, fails to track students' mastery of knowledge, difficult to assess whether students have developed the ability required by the course, fails to evaluate and feedback the learning effect of students in real time.

Obe Education Mode

The education model based on Outcomes of learning (abbreviated as OBE) is the basic education reform first appeared in the United States and Australia. In June 2013, China was accepted as a member of the "Washington agreement", and OBE has also set off a wave of enthusiasm in the domestic education circle. The OBE education model is a structural model which organizes, implements and evaluates education, with the expected learning output as the center. It requires educators to have a clear idea of the abilities that students should achieve upon graduation, and design an appropriate education structure, ensure that students master these abilities and the OBE education model upon graduation [4].

The implementation of OBE education mode includes four steps: defining learning output, realizing learning output, evaluating learning output and using learning output [5]. "Defining learning output" is the first step, which mainly describes the knowledge, emotion and skills that students should have when they graduate. "Realizing learning output" is design of teaching plan and course content to achieve expected learning output. It should follow the principle of "retrospective design", and achieve a complete matching matrix. "Evaluating learning output" is to evaluate the degree of realization of expected learning output, which can be divided into classroom level, professional level and school level. "Using learning output" refers to students' practice and action on "learning output" after graduation. OBE education mode realizes the fundamental transformation of education paradigm from "content oriented" to "student oriented" [6].

Under the traditional teaching mode, teaching content precedes teaching goal and occupies core position. But OBE education mode, based on the philosophy of "students as the center", emphasizes the students' initiative and the center position. In OBE mode, teaching goal precedes teaching content. OBE mode takes the reverse course design procedure, determine the teaching content and teaching methods according to the pre-determined teaching goals, helps students to achieve teaching results, and finally uses a certain evaluation method to test these results [7].

Curriculum Reform of Database and Data Warehouse Based on Obe Mode

Reference for domestic study of OBE's teaching ideas and practical results, combined with actual demand for Database and Data warehouse in big data environment, the paper researches curriculum reform of Database and Data warehouse, explores reform steps as follows, over OBE's mainline--"defining learning output- realizing learning output- evaluating learning output" [8].

Research the market demand, position the course target combined the professional graduation requirement. OBE emphasizes the teaching goals centered on ability cultivation [9]. Based on the investigation of enterprises, teachers, students, graduates and other stakeholders, combined with curriculum position, professional training target and professional graduation requirements, the expected learning outcomes(ILO) of students are determined, as shown in table 1.

Table 1 Expected learning outcomes based on graduation requirements

Graduation requirements		Index point	Expected learning outcomes
knowledge	basic professional knowledge	1.3.1 basic professional knowledge	ILO-1 understand and master the basic knowledge of database and data warehouse, can apply basic knowledge into practical problems.
ability	basic professional ability	2.2.1 analysis problems	ILO-2 understand the significance and function of analysis problems, master the basic methods of analysis problems, and use analysis methods to solve the practical problems of database and data warehouse
	core professional ability	2.1.1 overall thinking	ILO-3 identify and define a database or data warehouse system, understand the behavior of database and data warehouse, identify the interaction between database and the outside world and the impact on database behavior, and ensure a comprehensive understanding of database and data warehouse
		2.3.1 ability to conceptualize and abstract	ILO-4 grasp the conceptualization and abstraction methods of database and data warehouse, and solve the practical problems in database construction
		3.1.2 modeling	ILO-5 master the method of database and data warehouse modeling, and have the ability to establish scientific and reasonable database and data warehouse model.
		3.3.1 ability to process information	ILO-6 with basic DBMS software skills, can quickly and accurately collect, process, retrieve and organize database and data warehouse information.
		8.8.1 design and implement	ILO-7 according to the design of database and data warehouse structure, the implementation of database and data warehouse is carried out to ensure the smooth implementation process
quality	professional quality	5.1.2 learning attitudes and habits	ILO-8 develop positive learning attitude and correct learning habits, and have good autonomous learning ability

The paper set teaching objectives on OBE mode from knowledge, competence and quality. It's conducive to the learning of subsequent courses, and better support the corresponding indicators of graduation requirements of information management major.

Take the teaching goal as the guidance, reverse-engineer the teaching content, adjust the classroom organization form. According to course's teaching goal, teachers investigated industry environment and discipline prospects. Through professional discussions and course group discussions, teachers combed knowledge points of Database and Data warehouse, improved the teaching content, clarified the key points and difficulties, and designed the teaching links [10].

At the same time, teachers combed teaching content from the concept, knowledge, ability and application, and design corresponding exercise. Combining with integration design about teaching content, teachers cleared the purpose of the tasks, expected outcomes and implementation ways,

perfected teaching resources such as the curriculum standard, exercise library, case library, item bank, learning materials and so on.

Combining the characteristics of courses, teachers use diversified teaching methods to strengthen the connection between teaching contents and integrate knowledge in theoretical teaching. Combined with cases, teachers' pay attention to the combination of theory and practice in the teaching process. Due to the rapid development of database and data warehouse application in the big data environment, various teaching resources are fully utilized for students to discuss in class and study independently after class, so as to broaden students' theoretical knowledge and application ability. In the aspect of practical teaching, teachers should consider the verification and exploration of experimental content, the comprehensiveness, design and application of project content, cultivate students' innovation and creativity, and fully mobilize students' learning initiative.

Establish an outcomes-oriented evaluation mechanism. According to teaching goal and teaching content, the paper makes quantitative evaluation of the expected learning outcomes. Based on the traditional scoring way--"usual performance, project, exercise, experiment and final exam", the paper refines evaluation indexes and grading rules, builds course evaluation methods of Database and Data warehouse based on OBE. The assessment standards cover several graduation requirements, such as basic knowledge, basic ability, core ability and professional quality of the major. The expected learning outcomes support the corresponding graduation requirements of the course. The paper allocates the contribution degree of the expected learning outcomes, sets score of single assessment in ILO, specifies the assessment scoring standard, and then assesses the degree of students' achievement of the course. The detailed assessment method of this course is shown in table 2, which has a design specification and strong operability. In addition, according to the survey, the evaluation criteria for the expected learning outcomes is: the achieving degree less than 0.6 is lower than the expectation, the achieving degree between 0.6 and 0.85 is consistent with the expectation, and the achieving degree higher than 0.85 is beyond the expectation.

Table 2 ILO Weight and Score Setting of Single Assessment in ILO

ILO	ILO-1	ILO-2	ILO-3	ILO-4	ILO-5	ILO-6	ILO-7	ILO-8
weight	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1
assessment method	score setting of single assessment in ILO							
usual performance								5
project		10	10	10	10	10	10	10
exercise	7		3	7	7			10
experiment			15			15	15	15
final exam	6	54	25	25	25	2	45	100

Explanation: (1) achieving degree is calculated by setting score (2) final exam accounts for 60%

Analyze the teaching practice effect under OBE mode. In teaching of Database and Data Warehouse, teaching results are evaluated based on the above evaluation mechanism, and reflect for continuous improvement in subsequent teaching. Based on the sample data of 2017 students major in Information Management and Information System, the paper calculated ILO achieving degree by statistics, as shown in table 3.

Table 3 shows that achieving degree of the course reached 0.65, achieved the expected teaching goal. Achieving degrees of ILO-4 and ILO-6 are good, but achieving degrees of ILO-2 and ILO-8 are lower.

Table 3 ILO achieving degree statistic

ILO	ILO-1	ILO-2	ILO-3	ILO-4	ILO-5	ILO-6	ILO-7	ILO-8
weight	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1
assessment method	achieving degree of single assessment in ILO							
usual performance								0.72
project		0.76	0.76	0.76	0.76	0.76	0.76	0.76
exercise	0.74		0.75	0.74	0.74			0.75
experiment			0.74			0.74	0.74	0.74
final exam	0.54	0.58	0.7	0.7	0.52	0.28	0.54	0.55

Based on the above statistical data, especially the expected learning outcomes with a low achieving degree, Suggestions on the improvement of course teaching are put forward. (1) Strengthen the explanation of the basic theory with enterprise application, and deepen students' understanding of relevant concepts. (2) Teachers need to accurately grasp students' understanding of knowledge and timely adjust it according to students' acceptance. (3) Import homework management system to help students know their acquisition. Students can submit homework of each stage online, and they can immediately see their scores and correct answers. (4) Teachers urge students to spend time studying after class. Teachers regularly organize students to answer questions, coach and promote students' independent study after class.

Summary

OBE mode is an innovation of the traditional teacher-centered education mode. It reverses design of teaching content by emphasizing the result-oriented, establishes of evaluation mechanism and implement it. The implementation will help follow-up teaching. Under the guidance of OBE mode, Database and Data Warehouse carries out the teaching reform. Starting from the requirements of graduation, the course teaching form centering on students' learning achievements is constructed, it will continuously improve the teaching quality.

References

[1]Y.X. Yang and F.L. Zhou: Reform and Practice of Data Warehouse and Data Mining Curriculum Based on CDIO, Pioneering with Science & Technology Monthly, Vol. 9 (2015) No9, p 51-59.

[2]F. Xu and P. Zhang: Design of the Curriculum System for Cultivating Innovative and Entrepreneurial Talents in Application-Oriented Undergraduate Colleges and Universities in OBE Education Mode, Journal of Jilin Radio and TV University, Vol. 2 (2018) No10, p.21-22.

[3]M.L. Zhao and Y.L. Zheng: Theoretical and Practical of Teaching Discussion of "Data Warehouse and Data Mining", Science & Technology Vision, Vol. 1 (2013) No9, p.68-71.

[4]Z.Y. Li: Analysis of Outcome-oriented Idea of Engineering Education Professional Certification, China Higher Education, Vol. 9 (2014) No17, p 7-10.

[5]H. Fang and Y.J. Ju: Research on the Application of Case Teaching Method in Monetary Banking Based on OBE, China Economist, Vol. 1 (2018) No9, p.210-211.

[6]P.H. Gu, W.L. Hu and P. Lin: OBE Engineering Education Model in Shantou University, Research in Higher Education of Engineering, Vol. 1 (2014) No1, p 27-37.

[7]H. Ma: Reform and Practice of Management Curriculum in Universities Based on Outcomes-based Education Model, Education Teaching Forum, Vol. 9 (2018) No37, p.51-59.

[8]A.H. Liu and J. Chen: Reform and Practice of Database Curriculum Discussion Teaching Based on OBE Concept, Computer Education, Vol. 9 (2018) No9, p.112-115.

[9]J. Tang: Reform and Practice on GNSS Principle and Application Course based on OBE model, Engineering of Surveying and Mapping, Vol. 27 (2018) No19, p.71-75.

[10] J.F. Qiu, E.Z. Zhu and Y. Zhou: Reform of Operating System Course Teaching in OBE Education Mode, Computer Education, Vol. 6 (2015) No12, p.28-34.