Golden-Course Construction of "Database Principles and Applications" Based on OBE under Engineering Certification

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Abstract— This paper focuses on professional certification in engineering education. Based on OBE, it deepens the teaching-mode reform and practice of the course of "Database Principles and Applications", strengthens the ideological and political construction of the courses. By taking students' learning outcomes as guidance, it determines the ability goals and needs, reversely designs and optimizes the teaching system and content. Moreover, we actively explore and implement new teaching modes such as case-driven, task-guided, and flipped classrooms, construct online-offline hybrid intelligent classes, further optimize course assessment methods, and provide front-line teaching practice for teachers to explore the teaching reform of computer courses.

Keywords— OBE; Engineering certification; Golden course; Database principles and applications.

I. INTRODUCTION

Outcome-based education (OBE), student-centered teaching, and continuous improvement are three basic concepts of engineering education certification. It has become the focus of extensive attention of local applied universities in China to promote engineering education reform with the OBE concept[1] and improve the training quality of engineering talent. Wu Yan pointed out that Chinese universities should not only construct "golden majors" (namely first-class majors), but also "golden courses" (namely first-class courses)[2]. At present, we are in the process of deepening education and teaching reform. The applied transformation and engineering education certification are constantly advancing. The concept of OBE is in line with the needs of the applied transformation of our school, in line with the principles of education and teaching, and under the law of talent training, which has guiding significance for the training of applied professionals. Focusing on the transformation and development needs of engineering education certification, this paper explores the teaching reform and practice of "Database Principles and Applications"[3] based on the OBE concept. The goal is to make the course of "Database Principles and Applications" into a golden one and provide front-line teaching practice experience and reflection summary for teachers to explore course teaching reform.

II. CONSTRUCTION MEASURES OF THE GOLDEN COURSE OF "DATABASE PRINCIPLES AND APPLICATIONS" BASED ON OBE

Under the background of engineering certification, the construction and reform of the course of "Database Principles and Applications" need to further deepen the education idea with OBE. With the socialist core values as the lead and the students' learning outcomes as the guideline, it firstly needs to combine with national and industry demands for database applied talents to determine the training objectives and graduation requirements. According to the index point of graduation requirements, it then determines the curriculum system, the teaching requirements, and the teaching content, explores new course teaching methods, makes full use of network teaching platform, and builds a smart classroom or online-offline mixed new teaching model. At last, it evaluates the course implementation effect from a multi-dimensional perspective and makes continuous improvement.

A. Determine the capability-oriented target requirements

In the process of golden-course construction of "Database Principles and Applications", it is necessary to formulate students' ability training objectives, clearly give the learning objectives of the course, make clear what standards the course should follow, and cultivate students' comprehensive abilities. This strategy can not only determine the rationality of curriculum training objectives but also provide a reliable basis for students' ability assessment. Fully investigating the market demand for knowledge and skills of database talents, combining the "local, application-oriented, characteristic and high-level" university-running orientation with the training objectives of our school, it is determined that students should achieve the following training objectives. Table 1 shows the corresponding matrix relationship between course objectives and graduation requirements of course teaching.

Course Objective 1: Understand the basic concept of database, data model, database architecture, database system composition, database security, and integrity. *Course Objective*

2: Grasp the theory of relational databases, relational algebra, and relational data. Course Objective 3: Be familiar with SQL and be able to use the core commands (namely select, insert, update and Delete) to query, add, delete and modify databases. Master the basic programming technology of database systems. Understand the concept and application of view. Course Objective 4: Master the basic methods and steps of database analysis and design. Course Objective 5: Be familiar with query optimization theory, recovery technique, and concurrency control theory of databases.

TABLE I. Corresponding matrix relationship between course objectives and graduation requirements

Graduation Requirements	Course Objective
Knowledge Requirements	Course Objective 1, 2, 3, 4 ,5
Ability Requirement	Course Objective 2, 3, 4, 5
Quality Requirements	Course Objective 3, 4

B.   Reverse design of teaching system and content

According to the objectives and requirements of the course of "Database Principles and Applications", teaching content and experimental content are reversely designed based on the OBE. An example of the teaching system and content of

Chapter 2 "Relational Database" is shown in Table 2. Due to its strong theoretical and practical nature, the course should carefully design online and offline learning content in the design process of theoretical teaching contents, clarify learning objectives, improve students' interest, and optimize teaching content according to the needs of ability requirements to conform to students' cognitive rules. In the design of experimental content, emphasis is placed on cultivating students' ability to analyze, solve and innovate. In addition to conventional confirmatory experiments, emphasis is placed on design and comprehensive experiments. Meanwhile, OBE emphasizes cooperative learning and promotes the development of students' comprehensive abilities through teamwork and collaborative learning. The course design is an independent practical course by adopting teamwork in groups of three or four. With the actual design of database application systems and completion of the development of small information management systems, it deepens the application level of database systems and program design languages and enhances students' abilities of database application and innovation.

TABLE II. An example of the course teaching system and content

Teaching Content	Period Assignment	Ability Training Teaching Requirements	Supported Course Objectives	Students' Task		
				Requirements before Class	Class Discussion	Requirements after Class
Chapter 2 Relational database 2.1 Relational data structure and formal definition 2.2 Relational operations 2.3 Relationship integrity 2.4 Relational algebra	6	Master the concepts of relational database formalization; Grasp relational algebra operations and understand the integrity of relationships.	Course Objectives 2	Learn the content of this chapter independently on the MOOC platform of universities	Discuss rules for relational algebra operations, especially the join and division operations.	Complete course assignments, discussions, and tests on the MOOC platform of universities

C.   Vigorous promotion of the ideological and political construction of the course

OBE advocates students' independent learning, independent thinking, self-exploration, and self-improvement by using the network platform and network resources. However, college students are in the growth stage of knowledge system, thinking mode, and value concept. It inevitably will be affected by some inferior resources. Therefore, the first task of the golden-course construction of "Database Principles and Applications" is to foster students' character and civic virtue. It integrates ideological and political elements [4, 5] into the teaching content of the course, vigorously promotes the ideological and political construction of the course, implements the fundamental task of moral education, establishes socialist core values, strengthens the ideological and political orientation [6] and value guidance of classroom teaching, and plays the role of golden course in educating students. The golden-course construction should give full play to the ideological and political education function of specialized basic courses, and insist on the correctness of the course direction, the ideological content of the course, and the educational nature of the course teaching.

In the teaching process, we always campaign for moral education through the whole process and integrate the professional knowledge imparting and ability cultivation with

the emotional attitude, value orientation, and professional quality of students. Moreover, we further strengthen the guidance of value to students, enhance students' patriotic feelings and social responsibility, and cultivate the spirit of innovation and craftsman spirit of excellence.
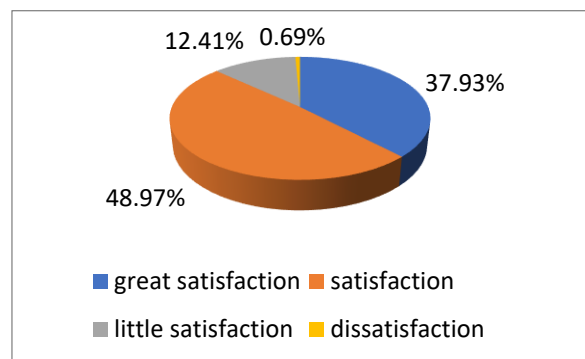

Fig. 1. The degree of students' satisfaction with ideological and political teaching of the course

A questionnaire was used to evaluate the effectiveness of ideological and political teaching for students of computer science and technology major (grade 2019) and internet of things engineering major (grade 2019). Statistical and analytical results show that 94.49% of the students consider the ideological and political teaching meaningful and fruitful, and

86.9% of the students are satisfied with the course's teaching, as shown in Figure 1. The evaluation results show that students have high satisfaction with the proposed teaching model and gain a lot. It is of help to improve students' professional quality, craftsman spirit, teamwork spirit, sense of responsibility, and law-abiding consciousness.

D. *Exploration and implementation of new teaching methods*

OBE emphasizes that the course teaching should be student-centered. Therefore, in terms of teaching method reform, we actively carry out research on new teaching modes such as case-driven teaching [7], task-guided teaching, and flipped classroom [8] to improve students' learning initiative, guide the students' independent self-exploration, and improve the innovation ability. As a result, a series of educational and teaching achievements have been achieved. In the process of project case-driven teaching, we guide students to independent thinking and improve the students' practical operation ability through the practice of project operation. Moreover, we adopt heuristic teaching methods to complete the teaching contents in the form of exploration and encourage students to learn autonomously. In this way, the classroom atmosphere of passive listening can be changed and students' participation in learning can be improved. In addition, the flipped classroom learning method is also used to improve students' classroom participation and the efficiency of classroom learning. In this teaching model, each group is responsible for a knowledge point with group collective learning. By guiding the group to study independently after class, it can improve the ability of independent inquiry, cultivate the ability of teamwork and enhance the ability of innovation and practice of students.

E. *Build online and offline hybrid wisdom class*

The golden course of "Database Principles and Applications" should take full advantage of network teaching platforms to construct a new model of smart classroom and online-offline mixed teaching [5]. Modern network teaching platforms such as the MOOC platform of universities are applied to form symbiotic classes and intelligent teaching. It can improve the innovation competitiveness of education and teaching by using intelligent platforms to create an intelligent learning environment, grasping classroom dynamics, analyzing classroom data, building an open and intelligent learning atmosphere. Students actively participate in teaching activities in the classroom, so that learners become classroom practitioners. Through the subversion of teaching forms such as pre-class task release and classroom content reversal, the starting point of the teacher's teaching is no longer the knowledge point of the textbook, but the students' understanding of the knowledge, so that the process of teaching becomes a dynamic and active-inquiry classroom for discussion and communication between teachers and students. Meanwhile, teachers can look up students' answers at any time, browse and analyze class data, rather than just ask questions to acquire the opinions of a few students. With a view of the students learning process, teachers can evaluate student learning outcomes in real-time, give immediate feedback, and give assistance and support to students. Subsequently, teachers can also timely adjust their teaching strategies according to the students' evaluation and feedback to suit the need of teaching objectives.

F. *Optimization of course assessment methods*

OBE emphasizes results-oriented learning outcomes. Therefore, the verification of outcomes should not be limited to the final exam. Under the guidance of the concept, assessment methods of the course of "Database Principles and Applications" pay more attention to process evaluation and formative evaluation. They include students' learning and personal performance in case-driven, task-guided, flipped classroom teaching process and online-offline hybrid smart classroom as parts of the final score. This assessment method can encourage students to change knowledge acquirement from passive acceptance to active absorption, improve their self-learning ability and teamwork ability, and truly cultivate students' comprehensive quality. More importantly, the educational idea based on OBE advocates that teaching evaluation is not the end. Teaching evaluation should evaluate the achievement of teaching objectives and feedback the evaluation results into the process of teaching strategy to achieve continuous improvement of the teaching quality.

III. CONCLUSIONS

Based on OBE, this paper deepens the teaching model reform and practice of the course of "Database Principles and Applications". It pays attention to students' ideological education and the cultivation of students' innovative practice ability under engineering certification. To jointly promote the construction of golden courses and engineering education certification of the data science and big data major and the computer science and technology major, our work provides front-line teaching practice experience and reflection summary for teachers in seeking classroom teaching reform.

REFERENCES

[1] Zhang Nanxing. Promotion of the Quality Improvement of Professional Education in Colleges and Universities with OBE Concept. University Education Science, 2019(2): 11-13.

[2] Wu Yan. Construction of China's "Golden course". China University Teaching, 2018(12): 4-9.

[3] Ya-ping Huang, Yong-liang Zhang. Practice of Blended Learning Based on "Database Principles and Applications" Online Course. 2011 International Conference on E-Business and E-Government (ICEE), 2011.

[4] Weiwei Liu. Case Analysis of Ideological and Political Teaching in the Course of "College English". 2020 International Symposium on Advances in Informatics. Electronics and Education (ISAIEE), 2020.

[5] Lin Ma, Junxia Zhang, Yanyan Jia, Bing Liu. Research on the Integration of Ideological and Political Education into the Curriculum Design of Landscape Architecture. E3S Web of Conferences, 2021.

[6] Xiaoran Lin, Yachao Wang, Rongmei Zhang, Tianhua Lin, Jianke Li, Xueya Xue. Ideological and Political Teaching Reform: An Introduction to Artificial Intelligence Based on the OBE Concept. 11th International Conference on Educational and Information Technology (ICEIT), 2022.

[7] Wang Yang. Analysis of Case-driven Database Recovery Strategies. Journal of Anqing Normal University (Natural Science Edition), 2019, 25(4): 119-121.

[8] Wang Haijun, QIU Changchun. Blended Teaching Mode Based on the Concept of OBE—Taking "Principles of Database System" as an Example. Journal of Hubei Second Normal University, 2021, 38(2): 76-79.