



Exploration of Project-Driven Teaching Curriculum Reform Based on OBE Concept

—Take Database Courses as An Example

Yimin Yang

The Higher Educational Key Laboratory for Flexible Manufacturing Equipment Integration of Fujian Province, Xiamen Institute of Technology, Xiamen 361021, China

yangyimin@xit.edu.cn

Abstract. In view of the characteristics of the database principle and application course and the problems existing in the new engineering background, in order to improve the teaching quality of the "golden course", combined with the university's goal of cultivating application-oriented talents, the course adopts reverse thinking, adopts project-driven teaching and breaks the traditional teaching mode, so that the cultivated students can meet the requirements of enterprises. This paper has carried out practical exploration around teaching content, teaching design and implementation, integration of theory and experiment, construction of question bank, assessment and evaluation, etc., and has achieved certain results. The results show that the teaching reform of this course has stimulated students' interest, adjusted the classroom atmosphere, and exercised students' practical ability. Thus, it cultivates students' ability to apply what they learn and solve problems.

Keywords: OBE education concept, Database principle and application, Reverse thinking, Project-driven teaching

1 Introduction

On November 24, 2018, Wu Yan, Director of the Department of Higher Education of the Ministry of Education, made a report entitled "Building China's Golden Curriculum". The report points out that curriculum is the core element of talent training, and it is a micro problem of education, but it solves a strategic problem^[1]. All colleges and universities are required to comprehensively sort out the teaching content of each course, eliminate the "water course", create "gold course", reasonably enhance the academic challenge, increase the difficulty of the course, expand the depth of the course, effectively improve the teaching quality of the course^[2], and build China's first-class "gold course" with advanced, innovative and challenging. Based on this requirement of curriculum construction, this paper takes the course "Database Principle and Application" as an example, takes OBE education concept as the basis, takes students as the center, combines students' expected learning outcomes and social needs, re-designs the

© The Author(s) 2024

C. Lin et al. (eds.), *Proceedings of the 2024 9th International Conference on Modern Management, Education and Social Sciences (MMET 2024)*, Advances in Social Science, Education and Humanities Research 880,

https://doi.org/10.2991/978-2-38476-309-2_57

teaching objectives and contents of the course, adopts project-driven teaching method, and carries out reform and practice of curriculum teaching, to construct a teaching design and assessment system that meets the needs of application-oriented personnel training, and provide support for the realization of database curriculum construction under the background of new engineering.

OBE education concept is a results-oriented, student-oriented, and backward thinking approach to the construction of the curriculum system, which is an advanced educational concept^[3]. The project-driven teaching method adopted in this course subverts the traditional bottom-up learning method and design ideas, and adopts the top-down design ideas. According to the needs of practical application, a project is taken as a case, and the task points are dismantled layer by layer. While completing the task points, the relevant knowledge points of the task are found to complete the basic learning. This kind of teaching change, it conforms to the education concept of OBE, but also conforms to the gold course construction requirements.

In order to meet the training requirements of high-quality applied talents under the background of new engineering, this paper rethinks the course content, teaching means, teaching methods and education mode of "Database Principle and Application", and realizes an important change from discipline orientation to industry demand orientation. "Database Principle and Application" in computer-related majors, such as information majors, is an elective course, and the teaching hours of the course are normally about 32 class hours. However, this course is closely linked with theory and practice, and practical courses pay more attention to students' practical skills, requiring students to learn how to store and manage data, learn to use the corresponding database management system, operating system and object-oriented language comprehensively, design a reasonable and efficient application system, and finally realize the application transformation of professional knowledge. In this case, how to carry out reasonable teaching design in limited class hours, and finally let students master practical operation skills and become practical professionals, so that students can meet the current direction of higher education personnel training and meet the development needs of society under the background of new curriculum reform. This is the significance of this course's reform.

2 Existing Problems

Principle and Application of Database is a traditional course with a long teaching history, especially in computer majors. It is a compulsory course with a lot of teaching experience. Some of the original teaching experience can be used for reference, but it may not be fully suitable for this course, which is currently used as an elective course.

1) Principle and Application of Database, as a required course for computer majors, has more class hours and enough time to cover basic knowledge such as relational database model and relational algebra operation, related operation of database, design, security and protection of database, and finally form a system architecture in accordance with bottom-up design ideas. However, as an elective course for related majors, less class hours is a problem that must be faced squarely, and the content taught is

limited. In order to meet the application-oriented goal of the school, it is necessary to ensure that students have the ability to complete the database design in the limited class hours, and effectively help students form the ability to solve complex engineering problems.

2) This course mainly adopts traditional teaching methods, and each knowledge is independent from each other^[4], and it is difficult to connect these knowledges into a network and form a clear knowledge vein. This reduces the complexity of teaching content and facilitates the development of teaching activities^[5], but the content is easy to learn and forget. Although information-based teaching is adopted, there are network video assisted teaching, but the content organization is the same as the textbook. This kind of bottom-up organization makes it difficult for students to form a system structure.

3) The experimental teaching of this course is generally set at the end of the theoretical teaching or near the end of the theoretical teaching in the last few weeks. When students carry out experiment, they often forget the relevant knowledges they have learned. Therefore, in the process of experiment, students become unable to start, or consume a lot of time, but the progress of the experiment is very slow, so that students always try to find ways to take the limited time and seek help from all parties, which weakens the ability to actively think and solve practical problems. Theoretical teaching is disconnected from practical teaching.

4) The theoretical content of this course is more than the experimental content. For some boring theories, with the increase of knowledges, students often become disinterested and lose their enthusiasm for class. Based on the mode of application-oriented talent training, we should give full consideration to setting up the practical content of “visible and tangible” in the practical course, so as to enhance the practicability and interaction of the teaching process.

3 The Idea of Reform

In view of the characteristics of database principles and application courses and the problems existing in course teaching under the background of new engineering, the teacher-led and student-dominated teaching mode is researched and implemented to stimulate students' interest and enthusiasm in learning and improve their practice and innovation level^[6]. Specific teaching reform ideas include the following aspects:

a) Teaching objectives

In order to meet the orientation of the university as an application-oriented undergraduate college, and to train students who can meet the requirements of enterprises, and seize the opportunity of curriculum reform vigorously advocated by the state, the reform of this course intends to change the traditional bottom-up learning method and design ideas, and proposes to adopt a top-down design idea, taking a project as a case according to the needs of practical application, and disassemble the tasks layer by layer. While completing the task, find the relevant knowledges of the task and complete the basic learning. In this way, it not only completes the requirements of the teaching syllabus, but also improves the students' ability of innovation and entrepreneurship. At the

same time, this is also in line with the concept of OBE. Based on the analysis of graduation requirements, students' knowledge and skills, the expected learning results of Database Principle and Application as an elective course are shown in Table 1.

Table 1. Expected learning outcome.

Graduation requirement	knowledge	skill
Ability to use professional knowledge to deduce, analyze and design database models	Understand concepts related to relational database basics	Ability to perform simple database design
Ability to use database system for operation and maintenance	Understand database integrity	Ability to use database management system for simple data management and maintenance
Ability to implement customized database programming with expertise	Master SQL data query language for data definition, data manipulation and data control.	Ability to use SQL language to implement database programming operations
Ability to realize the development and operation of database independently	Understand the development process of database application projects.	Ability to use the learned database for data query and statistics

b) Teaching content

Based on the present syllabus of the optional course "Database Principle and Application", on the basis of the unchanged content of the syllabus, the teaching order is reorganized to extract the key knowledges that can improve the engineering application ability for teaching. Centering on the development of the campus network management system, the main line to identify the application environment of database, demand analysis, system design and system implementation. According to the idea of modularization and systematization, the fragmented and scattered knowledges are constructed into a course content system which combines theory and practice with the goal of cultivating application-oriented talents facing the requirements of new engineering.

4 The Plan Adopted

In view of the problems faced by the database principle and application curriculum, the curriculum reform should adhere to the principle of student-oriented and teacher-assisted, and the teaching design, teaching implementation, experiment practice, test bank construction, evaluation and continuous improvement should all take this principle as the starting point. When the classroom is handed over to the students, the teachers change the teaching concept of indoctrination-oriented teaching, and turns to enlighten, guide, and explain as an aid. According to the learning results of the students, the teacher's teaching design and organization are continuously adjusted, so that the teacher's teaching can server the students' learning^[7].

1) Design of teaching content

Reasonable and effective organization of the existing teaching content of the course, scientific and timely reasonable distribution of the contents of each chapter is conducive to promoting each student to grasp the relevant curriculum knowledge quickly and comprehensively in a limited time. This course has many knowledges but limited class hour, so it cannot be fully explained and involved. Therefore, some chapter knowledges should be properly screened and different learning tasks should be set to meet the training objectives. In view of these knowledges, the task-driven teaching method is adopted^[8], the campus network management system is developed as a case, and the task is completed step by step, so as to realize the design and development of the system. In case development, all knowledges are effectively integrated into the tasks. This changes the traditional teaching methods. Students have difficulty in understanding and memorizing abstract knowledges, thus losing their interest in learning and reducing the participation rate of students.

The course takes a practical application case as the main line, and disassembles the tasks layer by layer. ① Through the tasks, find the learning results that students need to achieve; ② Through task analysis, let students understand why to achieve these learning outcomes; ③ Through practical operations and relevant knowledges, effectively help students achieve learning results; ④ Through classroom exercises or homework, check the mastery of relevant knowledges and consolidate the learning results that students have achieved. This not only conforms to the four problems emphasized in the OBE concept, but also keeps the original teaching syllabus unchanged. Reasonable teaching design is carried out, and the teaching content of this course is connected in series, so that students can form a macro understanding and have a systematic structure.

2) Implementation of teaching activities

Traditional multimedia teaching methods not only improve the overall efficiency of professional course teachers, but also reduce the workload of teachers. But at the same time, too much dependence on the content of electronic courseware will indirectly affect the participation rate of some students.

Teaching method innovation can effectively improve the classroom and teaching effect, is the key to classroom teaching. After the reform of teaching methods, before class, teachers take the lead in designing questions and constructing certain application situations, and students analyze and study the problems^[6]. Students actively consult information and study with problems, which is conducive to cultivating students' ability to solve problems. At the same time, the teachers design classroom test questions based on the knowledges of this lesson to check the students' preview. After the completion of the lesson preparation, pre-class tasks will be released through the learning channel, allowing students to study in groups or individuals^[9].

In class, according to the published questions, the students first explain the ideas of the questions, or discuss the ambiguous questions together. Then, according to the discussion results of students, the teacher guides the students to study the corresponding knowledges, or the teacher explains the knowledges to find the correct answer to the question. Then, the knowledges are drawn from one example, or extended. Students are encouraged to prove and share their learning results. Due to the project-based teaching

method, knowledge is fragmented, but knowledge fragments are threaded through projects. Therefore, before the end of class, teachers reserve some time for students to summarize knowledge in class, and synchronously write task documents, so that students can sort out the teaching knowledges again.

After class, students are required to submit the task document formed by the classroom practice through the learning channel. Teachers reflect on the teaching of this course, summarize and improve the teaching links^[9].

3) Intersperse theory and experiment teaching

According to the teaching hours of the course plan, the theoretical and experimental hours should be reasonably adjusted, and the combination of experiment and theoretical teaching should be considered to be completed simultaneously in class. Students can carry laptops to practice synchronously in class^[10]. In the process of theoretical teaching, combining the knowledges of teaching, the corresponding experimental content is used as a case study or an extension of the problem. This way encourages students to think more, guides students from imitation practice to independent operation, further deepens the learning of knowledges, helps students to master the relevant knowledges, and lays a solid foundation. Theory and experiment are interspersed in teaching, and the traditional way of theory before experiment is abandoned, so as to truly let students master knowledge and use knowledge. If there are enough hours, teachers can also adopt the form of curriculum design to organize students to carry out complete analysis, design and development practice independently, so as to exercise students' comprehensive application ability. During this period, teachers need to provide timely guidance on the questions raised by students, so that students can explore and learn according to their own internal needs, and give full play to their own enthusiasm, initiative and creativity^[10].

4) Construction of question bank

A perfect question bank helps to consolidate students' theoretical knowledge, improve students' practical skills, and provide strong support for teaching evaluation. This course uses task-driven teaching, which breaks the original chapter system structure, so it is necessary to write or collect questions to construct question banks for student self-testing, teaching assistance or examination evaluation. The scope covered by the constructed question bank should conform to the scope of knowledge covered by task-driven teaching, and be classified according to knowledge point, question type, difficulty, etc., so as to facilitate the management and use of subsequent questions. At the same time, in the process of teaching implementation, the question bank is updated and maintained regularly, such as adding questions, modifying wrong questions or adjusting the difficulty of questions.

5) Changes in evaluation

With the change of teaching methods, the curriculum assessment and evaluation system should be adjusted appropriately. A diversified assessment method that combines online and offline, process and final assessment can be adopted^[11]. According to the teaching implementation process, the online evaluation can be completed through the completion of preview tasks and pre-class discussion before class, and the evaluation result will be regarded as a part of the normal grade. In the classroom under the guidance of teachers, offline evaluation can be achieved through task-driven, interactive

discussion, practical operation, class attendance and other forms. After class, the online evaluation is completed in the form of class summary submitted online, computer experimental work, stage quiz, etc. The online and offline evaluation before class, during class and after class constitutes the process assessment. The process assessment mainly evaluates students' daily learning effect and practical ability, accounting for 40% of the total score, which can be increased to 50% after repeated teaching improvement. The final examination, accounts for 60% or 50% of the total score. It mainly focuses on the assessment of the mastery of basic theoretical knowledge and takes the form of examination papers at the end of the term. Such a diversified assessment method can effectively and objectively reflect the real learning situation of students, and teachers can effectively reflect on teaching and improve teaching, so as to improve teaching quality.

6) Continuous teaching improvement

In the process of teaching reform of this course, feedback on learning is collected through email, private message and face-to-face communication, so as to have a more comprehensive understanding of students' learning situation and needs, and teachers can also understand their own teaching advantages and disadvantages, so as to adjust teaching strategies, optimize teaching content, ensure that the teaching content conforms to students' cognitive rules and learning characteristics, and finally improve the teaching effect. In addition, according to the feedback of students, the teaching focus and difficulties can be adjusted appropriately to ensure that students can better grasp and apply the knowledge. At the same time, teachers should carry out continuous learning and reflection, understand the industry dynamics and the latest research results, constantly improve their teaching level and ability, reflect on their teaching practices and lessons, sum up successful experiences and shortcomings, and constantly improve their teaching strategies and methods.

5 Results of the Reform

1) Students' classroom performance

Before the teaching reform, the traditional teaching method was adopted, the theoretical class was in the multimedia classroom, and the experimental class was in the computer room. Students are less engaged in class, passively listening, and lack interaction and discussion. In the computer experiment, students think about the topic for a long time, and they have to turn the book while operating, which often consumes more time and has low efficiency. After the teaching reform, students have classes in the computer classroom for the whole semester, and students can also bring their own computers. In class, heuristic teaching, problem-oriented teaching and other methods are adopted to drive students to think by task, then discuss, and then draw a conclusion from one example to another. Experiment and theory are integrated to complete the experimental operation in ordinary class, so that students can understand and master knowledge at the same time, and can apply it to solve practical problems. It changes the way students master knowledge through rote memorization. After the teaching reform, students' participation in class has been significantly improved. Students take the initiative to ask questions and actively participate in classroom teaching activities.

2) Students' practical ability

Before the teaching reform, students tended to focus on theoretical learning, while practical operation opportunities were relatively few. And in the lab class, students lack the ability to think independently and solve problems when facing complex problems. After the teaching reform, attention is paid to practical teaching links, and courses such as classroom skill training and experimental operation are added, so that students' operational skills have been significantly improved. Let students learn to analyze problems and find solutions in practice, and gradually develop the ability to solve problems independently.

3) Students' test scores

Now, the final examination scores of students in the first semester of 2021-2022 academic year before classroom teaching reform and the first semester of 2023-2024 academic year after classroom teaching reform are compared, as shown in the examination paper analysis table in FIG. 1 and FIG. 2. In the first semester of the 2022-2023 academic year, this elective course was not offered due to insufficient enrollment. It can be seen from the statistics that after the teaching reform, the average score of students and the proportion of excellent students have been greatly improved, and the proportion of failing students has been greatly reduced. The overall grade distribution tends to be a more reasonable normal distribution.

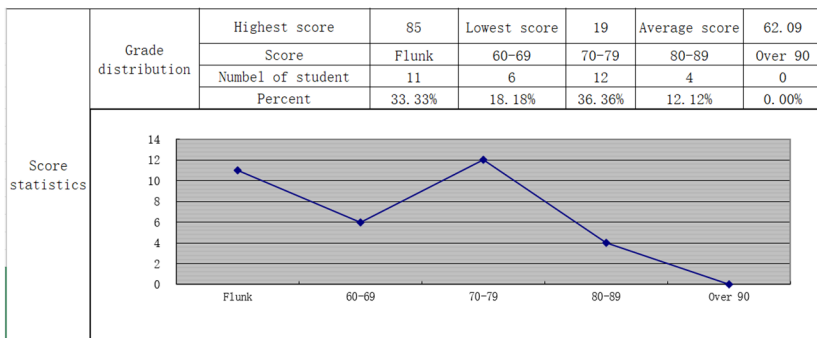


Fig. 1. Analysis table of examination papers in the first semester of 2021-2022 academic year.

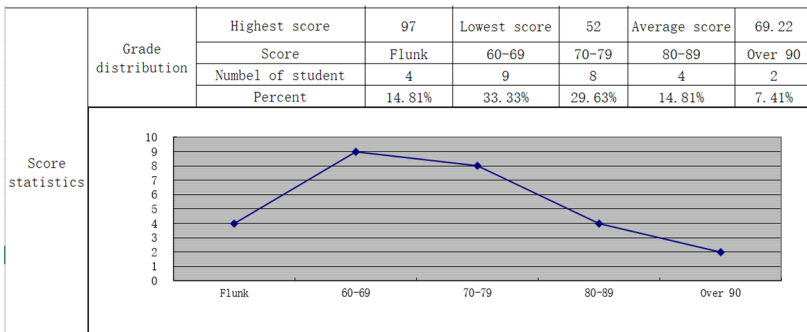


Fig. 2. Analysis table of examination papers in the first semester of 2023-2024 academic year.

6 Summary

Under the background of the proposal of new engineering, colleges and universities not only set up new engineering majors successively, but also break the boundaries of the original disciplines and reconstruct the knowledge system. On the one hand, they increased the school-enterprise cooperation, on the other hand, they innovated the classroom mode, and committed to cultivating high-quality interdisciplinary talents with strong engineering practice ability, strong innovation ability and international competitiveness to meet the future needs. Based on the development requirements of this new form, this paper carries on the teaching reform of the database principle and application course, in order to make students not only master the knowledge, but more importantly, use the knowledge to solve the existing problems and apply the knowledge practically. The teaching reform of this course focuses on teaching objectives, teaching content, teaching design and implementation, integration of theory and experiment, construction of question bank, assessment and evaluation, etc., and compares students' classroom performance, practical ability and exam scores before and after the teaching reform. The results show that the teaching reform of this course is very effective. To a certain extent, it stimulates students' interest, regulates the classroom atmosphere, exercises students' practical ability, and thus cultivates students' ability to apply what they learn and solve problems. During the implementation of the course teaching reform, the relatively insufficient is that the course needs to carry out several rounds of teaching practice due to the reason of course selection, in order to improve and consolidate the existing results.

Acknowledgments

The paper is supported by the Teaching Reform Research Project of Xiamen Institute of Technology in 2021 under grant No. XJYJG21011.

References

1. Huanhuan Chen. 2020. Analysis of human-computer interaction course characteristics and reform of teaching method. *Computer Era*, No. 6, 89-90+94. DOI: 10.16644/j.cnki.cn33-1094/tp.2020.06.026.
2. Li Huang. 2021. Research on flipped classroom teaching mode of digital architecture design I from the perspective of mobile internet . *Journal of architectural education in institutions of higher learning*, Vol.30, No.4, 118-124.
3. Youlin Huang, Yuhua Hou, Wei Li. 2022. Thinking and exploration of professional curriculum teaching based on OBE education concept under the background of new engineering. *The guide of science and education -- electronic edition*, No.6, 206-207.
4. Rashid T A . 2015. Investigation of instructing reforms in databases. *International journal of scientific & engineering research*, Vol.6, No.8.
5. Yin Zhang, Yuli Zhao, Bin Zhang, Kening Gao. 2020. Practice of modularized teaching content organization for project-based learning. *Education teaching forum*, No.36, 222-223.

6. Haiyang Hu, Zhongjin Li. 2018. Teaching reform of database system principle course centered on "Case decomposition lecture and project practice drive". Education teaching forum, No.50, 64-68.
7. Hui Lin. 2023. Research on teaching reform of database course based on OBE education concept. The guide of science and education, No.1, 61-63. DOI: 10.16400/j.cnki.kjdk.2023.1.020.
8. Knorr E M. 2019. Reforming a database course to address cognitive load by using worked examples. Proceedings of the western canadian conference on computing education, 2019: 1-6.
9. Feifei Li, Xiao Wu, Hongyu Shi, Dan Liu, Juan Liang. 2023. The teaching reform and practice of database principle and application course based on applied undergraduate in the view of "Golden Course". Computer knowledge and technology, Vol.19, No.14, 122-124. DOI: 10.14004/j.cnki.ckt.2023.0750.
10. Xin Fang.2019. Research on the construction of university "Golden Course" of database based on "Both-nature and One-extent". Microcomputer application, Vol.35, No.12,70-72.
11. Shaohui Yan, Jinda Zhang. 2020. Research on the teaching reform of python Programming Foundation under the background of "curriculum Ideology and politics". Digital world, No.11, 169-171.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

