

J2EE Architecture and Programming Based on OBE Concept Curriculum Objective Teaching Process Design and Research

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Abstract: Outcome orientation is the core requirement of the OBE concept. According to the actual needs of software engineering major, focusing on the development orientation of the university, the development needs of students and the requirements of the economy and society for professional talents, the training goals and graduation requirements for software engineering major have been formulated. Course objectives were formulated according to the principle of course objectives reverse design and graduation requirements. The core of whether teachers achieve course objectives is to design course teaching process. The design of course teaching process includes course objectives design, teaching content selection, students empowerment, teaching methods selection, degree of course objectives achievement and continuous improvement. Through the teaching process design of curriculum objectives, students can achieve teaching effects better and better realize the curriculum objectives.

1 INTRODUCTION

Outcome-based Education (OBE) was first proposed by Spady in 1981, and it was first implemented in primary and secondary schools in the United States, then the concept was adopted in higher engineering education and medical education in the United States, Australia, the United Kingdom, Singapore and other countries. It has been widely practiced (Spady, W. G., 1981). In recent years, with the addition of domestic higher engineering education professional certification to the Washington Accord and the implementation of audit and evaluation, OBE has gradually begun to be practiced in domestic higher education.

J2EE (Java Platform Enterprise Edition) is a version of the Java platform, which aims to provide large enterprises with a complete set of technical specifications and standards for developing enterprise-level applications. J2EE is just a set of protocol standards, not a development framework. Struts and Spring mainly support J2EE protocols. At present, the most popular development framework for enterprises and development is the Spring framework, which includes components such as ORM, MVC, and AOP. Based on the Spring framework, Springboot adopts the principle that convention is greater than configuration, and can quickly build applications.

The configuration is reduced, the code is more concise, and the development efficiency is higher. J2EE architecture and programming is a professional course for software engineering majors. Through the study of courses, it has the ability to use Springboot technology for enterprise-level development of small and medium-sized projects.

The traditional course teaching process is mainly to select appropriate teaching materials, write syllabus, choose case teaching or project-driven teaching methods in the teaching process during teaching progress, arrange homework and experiments, and the examination mainly includes mid-term exams and final exams. Student's final grade was assessed according to the proportion arranged in the syllabus. The teacher completes the teaching content and the students get course grades. Nobody cares if the course objectives are accomplished.

Outcome orientation is the core requirement of OBE concept, and the curriculum objectives are the basis for organization and implementation of course teaching process (Tian Jinghua, 2023). Based on the concept of OBE, through the principle of reverse design, the course teaching process mainly including: course teaching goal design, teaching content selection, student empowerment, teaching method selection, course goal achievement evaluation and continuous improvement.

2 COURSE TEACHING PROCESS DESIGN

Course teaching process design mainly includes course goal design, teaching content selection, student empowerment, teaching method selection, course goal achievement and continuous improvement. The following six parts will be deeply discussed.

2.1 Curriculum Objective Design

Course teaching process design includes course goal design, teaching content selection, student empowerment, teaching method selection, course goal achievement evaluation and continuous improvement (Wang Yongli, 2023).

1) Curriculum Objective Design

The formulation of course objectives is the core of course teaching. Instructional design includes forward design and reverse design. Forward design takes the curriculum as the core, starts with the construction of a subject-oriented curriculum system, and emphasizes the systematicness and completeness of subject knowledge system (Liu Jinghua, 2023). Therefore, in traditional teaching, teachers are centered. Teachers select teaching materials according to courses, determine teaching content, formulate teaching objectives, select teaching methods, implement teaching, and finally conduct examinations and teaching evaluations. There is no continuous improvement. Reverse design is based on "ability output" as the core. The needs of software engineering professionals determine the training objectives, the training objectives determine the graduation requirements, the graduation requirements determine the curriculum system, and then determine the curriculum objectives, as shown in Table 1.

Table 1. J2EE Architecture and Programming Course Graduation Requirements and Course Objectives.

Graduation Requirements	Course Objectives
Indicators 1-3: Be able to use software engineering expertise and mathematical analysis methods to deduce and analyze software engineering problems.	Ability to use software engineering expertise to analyze small and medium-sized projects; ability to deduce and analyze core business in the project development process.
Indicator point 4-3: Be able to build the experimental system according to the software engineering experiment plan, carry out the experiment safely, and collect the experimental data correctly.	Have the ability to write software engineering documents according to the project; have the ability to develop projects through the engineering documents of project software engineering, deploy projects in the production environment, and the projects can achieve the expected results.
Indicator point 5-2: Be able to select and use appropriate software development tools, information resources, and professional simulation software to analyze, calculate, and design complex issues in the field of software engineering.	Indicator point 5-2: Be able to select and use appropriate software development tools, information resources, and professional simulation software to analyze, calculate, and design complex issues in the field of software engineering.

2.2 Teaching Content Selection

Developing a course content that is well-defined, comprehensive and aligned with the intended course objectives can be very challenging (Murashige S., 1997). It requires careful analysis of industry needs, in-depth communication between school-enterprise cooperation and front-line development professionals of enterprises, and clarification of teaching content. Teachers are also required to occupy teaching resources as much as possible, self-study, lifelong learning, constantly update their own knowledge system, and choose the learning content of courses from as many angles as possible, online, offline, classroom, third party, etc. In this way, students can choose the appropriate teaching content according to the course objectives.

The choice of teaching content is the basis for realizing the teaching goal, so the teacher should reasonably decompose the teaching goal of the course into specific, measurable and executable sub-goals (Cao Yipeng, 2023). The study of the course content requires the completion of the corresponding course tasks. The teaching tasks should conform to the popular technology stack and general business implementation of the actual project development of the enterprise as much as possible. For details, see Table 2.

Table 2. J2EE Architecture and Programming Course Objectives and Course Content.

Course Sub-Goal	Course Content	Course Task
1 Ability to analyze small and medium-sized projects; 2 Ability to deduce and analyze the core business of the project; Ability to write project software engineering documents through analysis;	Use the object-oriented method of software engineering to analyze small and medium-sized projects; mainly including project background, technology stack and development tools, project analysis, project design, project implementation and testing; and writing project experiment reports	1 lab report (final exam) 1.1 Project Background 1.2 Technology stack and development tools 1.3 Project Analysis 1.4 Project Design 1.5 Project Realization 1.6 Project Test 2 experiments
3 Ability to analyze small and medium-sized projects; 4 Ability to deduce and analyze the core business of the project; 5 Ability to write project software engineering documents through analysis;	Select the project development framework based on the SSM framework of the Spring-boot micro-service architecture; Develop the core functions of the project; deploy and demonstrate in the production environment	2.1 Build SSM framework and unit test (experiment 3) 2.3 Realization of general addition, deletion, modification and query (experiment 4) 2.4 Use and Implementation of Online Documentation (Experiment 5) 2.4 Realization of one-to-one and one-to-many services (Experiment 6) 2.5 JWT implementation (midterm exam) 3 Project Deployment (Experiment 7) 5 Configure the project development environment (experiment 1)
6 Ability to analyze small and medium-sized projects; 7 Ability to deduce and analyze the core business of the project; Ability to write project software engineering documents through analysis;	The ability to configure the project development environment and configure and optimize development tools;	6 Configuration Optimization Development Tools (Experiment 2) Project Development (final exam)

Students should give timely feedback on completing the course tasks for teachers to understand the students' completion status. If they cannot complete the course tasks, they should be given another or several chances to complete. To enable students to complete course tasks and acquire corresponding abilities, the OBE concept focuses on students achieving course goals, which is the bottom line.

2.3 Student Empowerment

Student empowerment is the driving force for the realization of course objectives. It mainly includes: clear expectations, personalized learning, self-assessment and reflection, real-world relevance and skills for life-long learning.

1) Clear Expectations

OBE provides students with clear and transparent course objectives. Students know exactly what to expect and are able to track their progress towards those outcomes. This clarity empowers students to learn autonomously and set goals for themselves (Han Ming, 2023).

2) Personalized Learning

OBE allows for a personalized learning experience. Students can choose different course content according to course objectives, this customization enables students to shape their educational journey according to individual needs and desires. Active Participation: OBE encourages active learning and participation. Students actively participate in the learning process, participating in discussions, solving problems, and applying their knowledge to the real world. This active engagement enables students to become critical thinkers and problem solvers.

3) Self-Assessment and Reflection

OBE promotes self-assessment and reflection. Students are encouraged to assess their progress and reflect on their strengths and areas for improvement. This self-awareness enables students to take responsibility for their own learning and make the necessary adjustments to achieve their goals.

4) Real-World Relevance

OBE emphasizes the application of knowledge in the real world. Students are encouraged to relate their learning to real situations, which allows them to see the relevance and value of their education. This real-world relevance motivates students and prepares them for success beyond the classroom.

5) Lifelong Learning Skills

OBE provides students with essential lifelong learning skills. By focusing on critical thinking,

problem solving, communication and collaboration, OBE equips students to adapt to new challenges, embrace continuous learning, and thrive in a rapidly changing world (Liu Tingting, 2023).

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2.4 Choice of Teaching Method

The student-centered teaching method is adopted, and the choice of teaching method mainly plays an auxiliary role in realizing the course goal. Teachers can choose the appropriate teaching method according to the course goal to reorganize the teaching content and make the teaching content engineering. The course mainly uses the project-driven teaching method for teaching, and timely adopts the lecture method, project method, inquiry method, flipped classroom, online and offline mixed teaching, and realizes the organic linkage of various teaching methods. The course should focus on constructing the teaching content with the project development process, so that the fragmented knowledge learned by students can be transformed into a systematic one.

2.5 Evaluation of Course Goal Achievement

The evaluation of the attainment degree of curriculum objectives is mainly to evaluate the curriculum objectives from the subjective and objective perspectives. There are mainly three ways: standard evaluation, student self-evaluation and teaching supervision evaluation to complete the final course goal achievement.

1) Standard Evaluation

The standard evaluation is mainly through the course experiment, mid-term exam and final exam to calculate the evaluation of the degree of achievement of the course objectives according to Table 3. Only when the evaluation standard is greater than 0.7 can the degree of achievement of the student's course objectives be considered qualified (Liu Tingting, 2023).

Table 3. Evaluation of Course Goal Achievement Standard.

ID	Course Objectives	Evaluation Basis and Weight(%)			
		Weight	Final Exam	Midterm	Experiment
			Report	PD	
1	Indicators 1-3: Be able to use software engineering expertise and mathematical analysis methods to deduce and analyze software engineering problems.	30%	70%	10%	20%
2	Indicator point 4-3: Be able to construct the experimental system according to the software engineering experiment plan, carry out the experiment safely, and collect the experimental data correctly	40%		50%	30%
3	Indicator point 5-2: Be able to select and use appropriate software development tools, information resources, and professional simulation software to analyze, calculate, and design complex problems in the field of software engineering;	30%		40%	50%

2) Student Self-Assessment

Students' self-evaluation is mainly conducted through online questionnaires to obtain the degree of completion of course objectives. This kind of survey mainly depends on the attitude of the students, and is affected by various influences such as society, school, family, class, and personal environment, so it cannot reflect the degree of achievement of the curriculum goals, and it mainly serves as a reference.

3) Supervision and Evaluation

The supervisor evaluates the degree of course achievement through the usual lectures, course achievement research meetings, offline research reports and other methods. As a third-party evaluation, teaching supervision is private and not affected by the external environment. The evaluation of the degree of achievement of course objectives is relatively fair and reasonable. Inadequacies, due to the workload, the number of samples for evaluation may be insufficient, which cannot reflect the real evaluation of course achievement.

2.6 Keep Improve

Through the analysis of the evaluation data of the degree of achievement of the course objectives to obtain the situation of each student in the achievement of the course objectives, speculate and analyze the reasons for individual students to achieve the course objectives, and provide these students with measures and suggestions to achieve the "peak effect"; The key point is to analyze the reasons for individual unqualified students, and provide practical and effective solutions to enable students to complete the minimum standards for course attainment. And follow-up teaching improvement measures to improve the achievement of course goals.

3 SUMMARIZE

The design of the course teaching process includes five stages: the formulation of course teaching objectives is the core, the selection of teaching content is the basis for the realization of teaching objectives, student empowerment is the driving force for the realization of course objectives, teaching methods are the auxiliary to achieve course objectives, and the evaluation of course achievement is achieved. Continuous improvement is the internal cause of the realization of the curriculum objectives.

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