Teaching Reform Based on OBE Object-Oriented Programming Language (Java) Course

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Abstract—The course of object-oriented programming language (Java) is the core course of software engineering major, which is guided by the teaching concept of OBE, on the basis of the existing re-design of the teaching content, teaching methods ,curriculum assessment methods and assessment of the The course of object-oriented programming language (Java) is the core course of software engineering major, which is guided by the teaching concept of OBE, on the basis of the existing re-design of the teaching content, teaching methods ,curriculum assessment methods and assessment of the achievement of the goals. By evaluating the achievement of the goals, the above measures can better improve students' ability to develop By evaluating the achievement of the goals, the above measures can better improve students' ability to develop software systems and set up standardized system documentation, problem analysis, team cooperation and good communication skills, it can improve the By evaluating the achievement of the goals, the above measures can improve students' ability to develop software systems and set up standardized system documentation, problem analysis, team cooperation and good communication skills, it can improve the teaching effect of the course.

Keywords-Java Language; OBE; teaching reform

1 Introduction

The accreditation system of engineering education in China was formally launched in 2006 and has had a profound impact on the engineering education sector and achieved fruitful results[1][2] . The accreditation of engineering education has always followed the two core concepts of OBE and continuous improvement. OBE (Outcome based education) is called the concept of goal-oriented education, output-oriented education or demand-oriented education, etc.[3] . One of the core concepts of OBE is to insist on the outcome orientation, for which the outcome needs to be accurately mapped to the graduation requirements and scientifically defined. Another core of the OBE concept is student-centeredness, which is reflected through student-centeredness in the design of teaching and learning. The concept of continuous improvement is another core concept of engineering education accreditation, which can ensure and improve the degree of achievement of the educational outcomes of engineering education accreditation and social needs, and generate corresponding monitoring mechanism, evaluation mechanism and verification mechanism, thus playing a positive guiding role for engineering education accreditation[4]-[5] .

In engineering education accreditation, its standards can be generally divided into four major standards, and curriculum standards are one of them. The curriculum standards are based on the

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professional standards, which generally involve the formulation of standards for the objectives, contents, methods and standardization of assessment contents and methods of each course in the major, and can provide effective support for the professional training objectives and the achievement of graduation requirements. In this paper, the teaching reform of Object Oriented Programming Language (Java) (hereinafter referred to as Java) is also discussed from these aspects.

As a core course of professional foundation, Java plays a role in the whole course system, and provides important support for the subsequent courses, which is a course of both theory and practice. This course has more knowledge points, and many of them are abstract, especially the program structure is difficult to understand, so it is not easy for students who have initial contact with this course to get started. Problems in teaching: (1) the theory class is still the teacher as the main body for pure theory teaching; (2) the practical class is still a single basic programming content, lack of comprehensive application training; (3) Lack of procedural assessment and overly single assessment methods. Considering the characteristics of the curriculum itself and the existing teaching problems, and considering the factors of implementing OBE [6], under the trend of school engineering education certification, it is urgent to reform this curriculum based on the existing foundation [7] - [8].

2 Teaching Reform Based on OBE

2.1 Course Objective Modification

In the OBE concept, scientific course objectives need to be constructed in order to get a better formative evaluation method[9] . In the traditional syllabus, for the course objectives are generally limited to the mastery of each knowledge point, ignoring the overall comprehensive application, less consideration for the deepening learning of knowledge support that should be provided by the subsequent courses, and no clear support for the training program graduation requirements accordingly. Based on the existing problems, a series of measures are taken as follows: (1) to obtain valuable teaching experience through exchanges with teachers of other applied colleges and universities; (2) to know the employment needs through exchanges with senior personnel of ICT departments of cooperative enterprises such as colleges and universities and satisfaction surveys of graduates; (3) based on the preliminary exchanges and researches, the teaching team of this course organizes several teaching seminars to determine the requirements of this course according to the engineering accreditation of software engineering. (4) Based on the preliminary communication and research, the teaching team of this course organized several teaching workshops to determine the course objectives of this course corresponding to the indicator observation points in the accreditation, i.e. the support relationship to the graduation requirements[10] , so that the teaching content corresponds to the expected learning outcomes. The teaching team completes the revision of the syllabus based on the 0BE concept. There are three teaching objectives of this course in the engineering education accreditation of software engineering, which support indicator observation points 5.1, 5.2 and 9.1 and their weights, as shown in Table 1, and the three teaching objectives correspond to the three graduation requirement indicator observation points, so that the OBE concept defines the output results.

Table 1 Table of supporting weights of course teaching objectives and index observations

Serial number	Object-oriented programming language (java) teaching objectives	Support graduation requirement indicator observation points	Weights
Goal 1	Ability to design and develop software systems using Java programming language and create standardized system documentation	5.1 Design and develop software systems using appropriate tools related to the software engineering profession and be able to create standardized system documentation	30
Goal 2	Ability to analyze multiple solutions to complex problems in the field of software engineering and to understand the strengths and weaknesses of each solution.	5.2 Be able to analyze different solutions corresponding to complex engineering problems in the field of software engineering, and be able to understand the superiority and limitations of various solutions	40
Goal 3	Be able to understand the division of labor and characteristics of the different roles of individuals and teams, members and leaders, and be able to adapt to the roles of team members and team leaders and cooperate to accomplish the tasks undertaken.	9.1 Ability to function competently as an individual or team member in a multidisciplinary context;	30

2.2Optimization of course teaching system

The course is complicated and difficult, and the traditional teaching tends to focus only on the explanation of individual knowledge points, but less on the modular application of knowledge points and the overall comprehensive application of the course, resulting in the comprehensive application ability of students not being improved. According to the three teaching objectives in the previous chapter, based on the OBE concept, the teaching content design, teaching method design, teaching process facilities and teaching result evaluation are improved to optimize the teaching system.

1)Improve teaching methods

The traditional teaching methods used in course design classes are lecture method and demonstration method. The lecture method, with the teacher as the main body, can impart scientific and cultural knowledge to students in a short period of time, but its limitations are easy to form the habit of passive listening, easy to lead to full lecture, not conducive to teaching according to the material, and can not take into account the individual differences of students. Demonstration method is to help students understand concepts, principles and laws and other theoretical knowledge by showing demonstrative experiments or using modern teaching methods in the teaching process, whose limitation is that students only grasp some fragmented knowledge from textbooks and it is difficult to play a role in practical engineering applications. Therefore, the traditional teaching method is easy to lead to full lectures, ignoring the main position of students and their individual differences, which leads to low interest of students in learning and poor teaching effect. In order to adapt to the reform of engineering education accreditation, we must firstly reform the teaching methods, which can be changed to diversified ways such as heuristic teaching, interactive teaching, project-driven teaching[11] , online and offline hybrid

teaching[12]-[13] , etc. No matter what teaching methods are used, the teaching is always carried out with students as the main body and teachers as the guide. The application of these teaching methods will be reflected in the subsequent teaching organization.

2)Optimization of teaching content

Java is a course that requires "can solve problems + can program", so the course requires an overall understanding of the idea of object-oriented programming, but also requires memory and repeated practice of its syntax, implementation principles, application scenarios, etc. in detail. Therefore, the rationalization of the teaching content will be divided into framework knowledge and functional knowledge, and of course the two types of knowledge are complementary to each other.

(1) framework knowledge: the basic part of object-oriented programming, including classes, encapsulation, objects, inheritance, abstract classes, polymorphism and interfaces, etc.

(2) functional knowledge: network functions, I/O streams, JDBC, multi-threading, GUI and other JDK API parts

(3) Organic combination of the two types of knowledge through the design of a system, second-hand housing rental system mainly with a real enterprise project to introduce the overall integrated application of the course, and the other in the form of a group, students independently choose a project to develop, the cycle of teaching cycle.

3) Improvement of classroom teaching organization

The design of teaching organization is the core of teaching implementation and the soul of teaching classroom, which needs to change the traditional classroom teaching mode[14] . The course is organized as a theoretical classroom and practical classroom, supplemented by post-class extension and post-class practice.

In the theory classroom, the teaching is organized in a hybrid online and offline mode. Due to the limited classroom time, the online part mainly allows students to pre-study the basic theoretical knowledge of each class in the module independently first, and then have more time to carry out the implementation of the project case or project in the classroom. The online learning is mainly through the teaching videos of the course "Java Programming" on Super Star Learning Platform, and completing the practice questions after the corresponding knowledge points. The video has the statistics of watching, the objective questions of the exercises will be automatically graded by the platform, and the teacher will review the subjective questions. Therefore, the online teaching part can be effectively supervised by the learning platform, and the assessment data of this part can be incorporated into the process assessment, which has proved to be effective after two semesters of practice, as shown in Figure 1 and Figure 2. Based on this situation, the teacher can remind the students who have not studied in time to do the online pre-study and complete the tasks of the pre-study session through the announcement on the platform. Figure 2 shows the statistics of the pre-study corresponding to the chapter exercises. The video learning and practice results are announced in the class communication group every week after class, and the pre-study tasks for the next week are assigned.

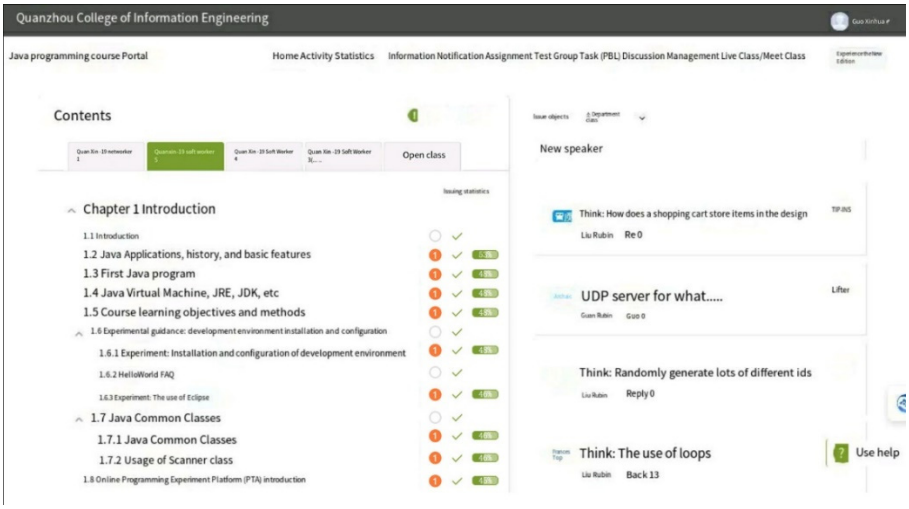

Figure 1 Video learning statistics char

Serial number	Student/job number	Chapter Quiz (100%)	Overall score
1	1903010532	94.0	94.0
2	1903010536	93.0	93.0
3	1903010543	93.0	93.0
4	1903010548	92.5	92.5
5	1903010504	90.0	90.0
6	1903010501	89.0	89.0
7	1903010523	88.0	88.0
8	1903010512	85.0	85.0
9	1903010508	83.0	83.0
10	1903010530	76.0	76.0
11	1903010534	76.0	76.0
12	1903010558	73.0	73.0
13	1903010515	71.0	71.0

Figure 2 Statistical chart of chapter course quiz section scores

The offline part of the theoretical classroom is a key part of the teaching organization. Based on the online pre-study, it is possible to release the tradition of teaching in the classroom in stages in the form of modules, where each task of the module is driven by a small case, and each module has a more integrated project to carry out all the tasks in series and to apply the whole module in a more systematic way. In each task implementation plan, the class is divided by 4-5 people, and the group is used as a unit to guide and inspire students to solve the practical problems in the tasks, combined with the classroom interaction on the learning platform, to answer the teacher's questions individually or as a group, to fully mobilize students' learning initiative and enthusiasm, to enhance their interest in learning, and to form a good learning atmosphere. In the theoretical

class, basic theoretical knowledge is mastered and applied through cases or module projects in the tasks as much as possible.

In the practical classroom, there are traditional problems such as focusing on design and less comprehensive practical training, ignoring the relevance to other courses. In order to overcome the traditional problems, we can increase the number of integrated practical training and strengthen the application of bridging knowledge between other courses in this curriculum in terms of content. In the practical class, there are three main parts: comprehensive practical training, project explanation and mutual evaluation. The teacher first introduces the objectives to be achieved in the integrated practical training, then analyzes the knowledge points used, then explains the practical training steps, and finally guides the students to complete the practical training and submit the standardized practical training materials as a group. In the last 20 minutes of each practical class, let 1-2 groups of students send representatives to explain the highlights and innovations of the group's problem solving, and other groups will give comments, and the mutual comments of other groups will be 30% of the practical training grade, while the teacher's comments will be 70%, and the two parts will together form the grade of a certain practical training. The comprehensive practical training in the practical class helps to cultivate students' ability to solve practical problems, project analysis and design, teamwork and good communication, innovation ability, and lay the foundation for students to develop projects independently.

Whether it is a theoretical classroom or a practical classroom, time is limited, and based on the characteristics of the course itself, it is far from enough to rely only on classroom teaching and practical classroom, and it is necessary to strengthen the extension of independent learning after class. The first after-class extension is the use of the PTA platform (this platform belongs to the programming class experimental teaching platform), in the PTA platform can be used as a basic problem set can be used as the consolidation of the foundation of the theoretical class, but also can be used as a more comprehensive problem set as a comprehensive application of the practical class to enhance, better make up for the lack of independent consolidation of learning supervision of students outside the classroom. There are problem sets for knowledge points and also comprehensive problem sets. As shown in Figure 3, this problem set is a semester problem set from the basic module to the more comprehensive module, basically covering the entire knowledge base. The second extension is that at the beginning of the school year students choose a project of interest to develop on their own as a group. Each group needs to have a clear division of labor, a purposeful, organized and planned project analysis, project design, project implementation, project testing, project evaluation, and finally complete the project development by the end of the semester.

In addition to this, students are encouraged to actively declare dual-innovation projects, join professional societies, and participate in various related competitions, so as to promote learning through practice and events, improve project development ability through practice, and better promote the achievement of teaching objectives.

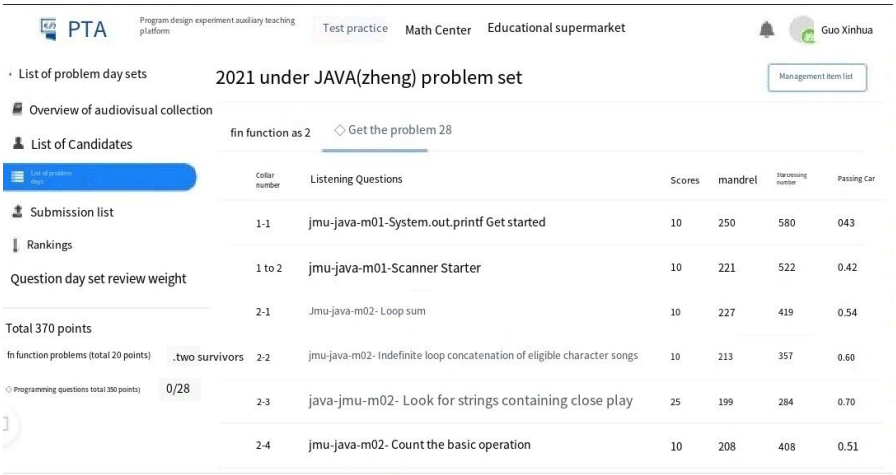

Figure 3 PTA semester question set

2.3. Improvement of course assessment methods

Course assessment is the main way to evaluate the effectiveness of the implementation of the whole course, and is a very important part of the course. The traditional assessment is often based on the final assessment, which is too single and cannot really test the level of students, let alone detect the effect of teaching. In view of the applicability of the course as well as the strong practicality and other factors, the traditional assessment method is reformed to change from assessing the course results to evaluating the effectiveness of the course, from focusing on the end results to the learning process, increasing the process assessment, and adopting a course examination and assessment method through diversified and multi-dimensional, oriented to the output results, to cultivate students' abilities corresponding to the course objectives[15] [16].

This course corresponds to 3 course objectives, which are.

(1) Course Objective 1: To be able to design and develop software systems using the Java programming language, and to create standardized system documentation

(2) Course Objective 2: Be able to analyze multiple solutions to complex problems in the field of software engineering and understand the strengths and weaknesses of each solution.

(3) Course Objective 3: To be able to understand the division of labor and characteristics of the different roles of individuals and teams, members and leaders, and to be able to adapt to the roles of team members and team leaders and cooperate to accomplish the tasks undertaken.

According to the course objectives, the assessment is divided into process assessment and final assessment. Process assessment is divided into usual performance and practical training. The usual performance includes the following parts.

(1) Online learning component, including video learning, post-class chapter testing, accounting for 50% and 20% of the usual grade, respectively.

(2) Classroom performance part, through the classroom questions, posted on the platform such as question and answer, discussion to improve students' interest and participation in learning, accounting for 30% of the usual grade

The practical training includes several aspects.

(1) The practical training tasks to be completed in the practical training class are reflected in the original code and laboratory reports, and the grades of individual practical training tasks are composed of 30% of the group mutual evaluation grades and 70% of the teacher evaluation grades. It accounts for 40% of the total practical training grade.

(2) PTA platform brush questions, corresponding to the session question set and semester question set, accounting for 20% of the total practical training grade

(3) Students choose their own projects in groups, develop actual projects from the beginning of the semester to the end of the semester, submit designs and descriptions, and give group project presentations, with grades consisting of 30% group mutual evaluation and 70% teacher evaluation. It accounts for 40% of the total practical training grade.

Final assessment: practical assessment (PTA platform examination): 120 minutes, test questions to part of the basic questions, more comprehensive programming questions, comprehensive strong programming questions in three layers of assessment, should be appropriate for medium level candidates to answer all the test questions within the specified time. Reasonable distribution of the assessment ratio to truly achieve the goal of fair and just assessment.

Course grade (total evaluation) = classroom performance * 20% + practical training grade * 40% + final exam grade (PTA platform exam) * 40%.

Several parts of the above assessment make up the assessment of the course, making the assessment diversified and multi-dimensional and multi-faceted, paying more attention to the monitoring of the learning process, the refinement of the stage assessment, and highlighting the importance of practical programming skills.

2.4. Assessment of the achievement of course objectives

According to the study of professional teaching steering committee of the college to determine the benchmark point of this course teaching goal achievement evaluation is more than 60% of the standard value of the indicator observation point is qualified, otherwise it is unqualified.

The methods used to evaluate the achievement of course objectives include course assessment score analysis and scoring table method.

(1) Course assessment score analysis method

The evaluation data used in the course assessment performance analysis method is the data on the achievement of technical indicators directly related to the profession. Based on the assessment materials of each course, according to the different ways of course assessment, including test papers, mini-essays, internship reports, assignments, experiments and innovation, etc. The corresponding data should clearly point out the corresponding scoring criteria of the course support observation points.

(2) Scoring table method

The scoring table method formulates detailed and measurable evaluation indicators based on observation points, sets achievement levels, and provides scientific and qualitative descriptions of different achievement levels to form a scoring table. The evaluation of a student's achievement in a certain indicator can be based on their practical training, daily performance, final exams, and other data, and the total achievement evaluation value of that indicator can be obtained [17] . Further sum up the various indicators to obtain statistical tables for the degree of achievement of course objectives and graduation requirements observation points, as shown in Tables 2 and 3.

3 Results and Analysis

3.1 Achievement statistics

The reform of teaching is achieved through the analysis of course assessment scores and the scoring table method, and the degree of achievement of course objectives and graduation requirements observation points is shown in Tables 2 and 3.

Table 2 Course Objective Achievement Statistics

Serial number	Final Paper Statistics			Usual grade statistics				Statistics of practical training results				Goal 1-3 combined achievement			Achievement of course objectives
	Goal 1	Goal 2	Total score	Goal 1	Goal 2	Goal 3	Total score	Goal 1	Goal 2	Goal 3	Total score	Goal 1 Achievement Score	Goal 2 Reach Degree Score	Goal 3 Achievement Score	
	Score	Score		Score	Score	Score		Score	Score	Score					
1	34.4	51.6	86.0	17.8	17.8	35.6	71.1	7.3	7.3	29.3	44.0	23.0	31.6	15.9	70.4
2	32.0	48.0	80.0	16.4	16.4	32.7	65.5	10.2	10.2	40.7	61.0	22.3	30.3	18.7	71.4
3	27.2	40.8	68.0	16.8	16.8	33.5	67.1	9.5	9.5	38.0	57.0	19.8	26.6	18.1	64.5
4	31.2	46.8	78.0	12.4	12.4	24.8	49.7	7.7	7.7	30.7	46.0	20.4	28.2	14.2	62.7
5	31.6	47.4	79.0	17.3	17.3	34.5	69.1	9.2	9.2	36.7	55.0	22.0	29.9	17.9	69.8
6	33.2	49.8	83.0	15.6	15.6	31.3	62.6	6.8	6.8	27.3	41.0	21.8	30.1	14.5	66.3
7	35.2	52.8	88.0	16.3	16.3	32.6	65.1	8.5	8.5	34.0	51.0	23.4	32.2	16.7	72.3
8	36.4	54.6	91.0	21.5	21.5	42.9	85.9	9.2	9.2	36.7	55.0	25.2	34.3	19.6	79.2
11	30.0	45.0	75.0	21.1	21.1	42.3	84.5	9.5	9.5	38.0	57.0	22.1	29.6	19.9	71.5
12	35.6	53.4	89.0	23.4	23.4	46.9	93.8	10.0	10.0	40.0	60.0	25.5	34.4	21.4	81.3
13	32.8	49.2	82.0	14.5	14.5	29.0	58.0	6.7	6.7	26.7	40.0	21.3	29.5	13.8	64.6
14	24.4	36.6	61.0	16.2	16.2	32.3	64.6	9.7	9.7	38.7	58.0	18.3	24.4	18.1	60.8

15	28.4	42.6	71.0	17.8	17.8	35.5	71.1	7.8	7.8	31.3	47.0	20.1	27.2	16.5	63.8
16	30.0	45.0	75.0	17.2	17.2	34.3	68.6	16.2	16.2	64.7	97.0	23.3	30.8	26.3	80.3

Table 3 Achievement statistics of graduation requirement observation points

Serial number	Goal 1 5.1 Be able to select and use appropriate software development tools and resources to design and develop software systems or functional modules	Corresponding observation 5.1 point attainment	Goal 2 5.2 Be able to select and use information technology tools for experimental data storage, cleaning and analysis, and standardize the creation of software documentation	Corresponding observation point 5.2 degrees of attainment	Goal 3 9.1 Ability to assume the role of an individual and team member in a multidisciplinary context	Corresponding observation point 9.1 degrees of attainment	Total Achievement
1	23.0	76.5%	31.6	78.9%	15.9	53.0%	72.0
2	22.3	74.4%	30.3	75.8%	18.7	62.5%	72.9
3	19.8	66.0%	26.6	66.5%	18.1	60.4%	65.8
4	20.4	67.9%	28.2	70.5%	14.2	47.2%	64.1
5	22.0	73.3%	29.9	74.8%	17.9	59.7%	71.3
6	21.8	72.6%	30.1	75.2%	14.5	48.2%	67.8
7	23.4	78.0%	32.2	80.5%	16.7	55.7%	73.9
8	25.2	84.1%	34.3	85.9%	19.6	65.3%	80.9
11	22.1	73.6%	29.6	73.9%	19.9	66.2%	73.0
12	25.5	85.0%	34.4	86.0%	21.4	71.3%	83.0
13	21.3	71.0%	29.5	73.7%	13.8	46.0%	66.0
14	18.3	61.1%	24.4	61.1%	18.1	60.2%	62.0
15	20.1	67.0%	27.2	68.0%	16.5	55.0%	65.2
16	23.3	77.6%	30.8	77.0%	26.3	87.5%	81.9

3.2 Assessment of the achievement of course objectives

Table 4 below provides an overall assessment of the achievement of the course objectives based on Tables 2 and 3, and contains basic information about the course, the overall achievement, the support matrix of the assessment sessions for the course objectives, the distribution of the sample achievement, and the support materials for the achievement evaluation.

Table 4 Overall assessment of the achievement of course objectives

Course Basic Information				
Course Name	Object-oriented programming language (Java)		Lecturer	Guo Xinhua
Course Number	0311145		Class Year	Class of 2019
Number of students participating in the evaluation (sample size)	62		Class start time	Second semester of academic year 2020~ 2021
Evaluation of the achievement of course objectives				
Assessment methods: classroom performance / regular quizzes / course reports / course assignments / midterm exams / final exams / comprehensive training / other				
	Course Objectives		Achievement	Achievement

						Expected Value	Average value
Overall Reach degree of affection Situation	【1】 Be able to use Java programming language to design and develop software systems, and create standardized system documentation					0.6	0.793
	【2】 Be able to analyze multiple solutions to complex problems in the field of software engineering and understand the strengths and weaknesses of each solution.					0.6	0.92
	【3】 Be able to understand the division of labor and characteristics of the different roles of individuals and teams, members and persons in charge, and be able to adapt to the roles of team members and team leaders and cooperate to accomplish the tasks undertaken.					0.6	0.796
Assessment Sessions Right Lesson Program Subject Support Moment Array	Appraisal Method and the proportion of		Usual performance		Practical training		Final Exam
			20%		30%		50%
	[1].		0.25		0.167		0.40
	[2].		0.25		0.167		0.60
	[3].		0.5		0.666		0
	∑		1.0		1.0		1.0
Distribution of sample attainment	Courses Objectives	Achievement Interval	(0, 0.6)	[0.6,7)	[0.7,0.8)	[0.8,0.9)	[0.9,1.0)
	[1].	Number of people (person) Percentage (%)	3 4.48%	10 16.13 %	18 29.03%	21 33.87%	10 16.13%
	[2].	Number of people (person) Percentage (%)	1 1.61%	2 3.23%	5 8.06%	4 6.45%	50 80.65%
	[3].	Number of people (person) Percentage (%)	2 3.23%	3 4.84%	25 40.32%	30 48.39%	2 3.23%
Achievement evaluation support materials	1. Assessment source data (including 62 final PTA exam papers: 6 PTA problem set assignments, 372 in total; 8 on-line lab reports, 495 in total; 1 project assignment, 15 groups, 15; 1 study statistics on the Learning Pass platform) ; 2. Examination transcripts (including 1 copy of the final report card; 1 copy of the usual performance report card; 1 copy of the PTA problem set assignment report card; 1 copy of the on-line experiment report card, and 1 copy of the project assignment report card). 3. Analysis sheets on the degree of achievement of students' course objectives (theoretical courses). etc.						

3.3 Analysis of the achievement of course objectives

1) Evaluation of achievement analysis results

From the average performance of the three objectives in the overall achievement of the class, the average value exceeds 0.6 achievement expectation, and the overall teaching objectives of the course are well achieved; however, there are individual samples of course objectives 1~3 that do not meet the achievement requirements. Through the revision of teaching objectives, the optimization of teaching contents, the improvement of teaching methods and assessment methods,

the teaching objectives are well achieved, but further optimization can be carried out to improve the overall achievement of the course objectives.

2) Continuous improvement views

For the achievement of course objective 1 and course objective 3, the comprehensive practice within the classroom can be strengthened, and also through extra-curricular practice, such as declaring dual-creative projects, joining professional clubs, and participating in various Java-related events, to strengthen the practical work, so that students can really improve their integrated application ability and innovation ability.

4. Conclusions

In this paper, based on the curriculum objectives of engineering education certification for software engineering majors, and guided by OBE teaching concept, reform is carried out in several aspects: (1) optimization of teaching contents in modules; (2) improvement of teaching methods, replacing the traditional full classroom teaching methods with teaching methods such as heuristic teaching, interactive teaching, project-driven teaching, online and offline hybrid teaching; (3) organization of classroom from theoretical classroom (3) the organization of the classroom is optimized from online and offline hybrid teaching in the theory classroom, comprehensive training in the practice classroom, extension after class, and practice outside class; (4) the assessment method of the course is changed from a single assessment to a diversified and multi-dimensional process assessment. The effectiveness of the above-mentioned reforms is analyzed through the assessment of the achievement of the objectives. After the goal achievement assessment, the teaching objectives of this course are well achieved, and the students' ability corresponding to the three observation points is better improved, but there is still room for improvement, and the achievement of the course objectives can be improved by further strengthening the comprehensive practical training in class and extra-curricular practice.

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