

CONSTRUCTION AND APPLICATION OF PROJECT DRIVEN "ONE BODY, TWO WINGS AND THREE STAGES" TEACHING MODE BASED ON OBE CONCEPT

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ABSTRACT

In view of the lack of engineering practice ability of software engineering students, the "one body, two wings and three stages" teaching mode running through the project is applied to the teaching process. Through the construction of double project driven and double tutor guidance, students' engineering practice ability has been cultivated, and certain results have been achieved, which provides a reference for the construction of project driven Teaching in related majors.

KEYWORDS

OBE, Project Driven, Dual Mentors, Practical Ability

1. INTRODUCTION

China officially joined the Washington Agreement on international engineering education in 2016, marking that China's engineering education quality certification system has achieved international substantial equivalence, and the quality standards of engineering majors have reached international recognition [1]. The basic concepts of the agreement mainly include student-centered, student learning results oriented education and continuous quality improvement. Among them, outcome based education (OBE) education is an educational concept oriented by students' learning outcomes. China's engineering education certification standard (revised in November 2017) follows the outcomes based education (OBE) model, that is, goal oriented education or ability oriented education, emphasizing the development of training goals according to school positioning and social needs. In the engineering education certification standard, it is proposed that the graduation requirements formulated by the major should fully cover the engineering knowledge, problem analysis, design / development solutions, research / use of modern tools, etc. of "solving complex engineering problems" [2]. The Chinese computer society has added standards specifically for computer related majors, requiring that the curriculum should include content that can cultivate students' practical ability.

"Java Web Programming", as a technical basic course of software platform development, is a professional course offered by computer related majors in many Application-oriented Undergraduate Colleges and universities. Based on the Java language, this course focuses on servlet, JSP, JDBC, El, JSTL and other technologies, so that students can master the basic theory and core technology of web program development; Through solving practical problems, improve students' ability to analyze and solve problems in the process of program design; Through the use

of integrated development tools to write and debug programs, students' practical ability is improved, so that students' theoretical knowledge and practical ability can be developed together [3].

The traditional teaching mainly focuses on transferring knowledge. The curriculum pays attention to the amount of students' knowledge reserves, and does not pay attention to the cultivation of students' ability to apply knowledge. In the course of teaching, teachers mainly talk about grammar, supplemented by cases. Students cannot comprehensively apply knowledge to complete the development of simple web projects. The experiments set up are mostly confirmatory experiments, which are mainly used as a supplement to theoretical teaching and a link in the process of theoretical teaching. And an experiment has only one topic. The teacher talks about ideas, and then leads the students to write code by modules and functions. The result of this method is that students simply and mechanically follow the rhythm of the teacher to knock the code, without their own ideas and methods. Students' experimental results are basically the same, without discrimination, and their ability to solve problems independently has not been trained. The assessment of the course is divided into usual assessment and final assessment. The usual assessment includes attendance, homework and experiment, and the final assessment includes examination. The examination mainly tests students' mastery of grammar knowledge in the form of objective questions such as multiple-choice questions and blank filling questions. The above methods can not fundamentally exercise students' practical ability to solve engineering problems. As a practical course, in the teaching process, we need to strengthen the strength of practical training, and we need to change the teaching methods. Project-driven teaching method is a teaching method to achieve teaching goals. It takes the teaching content as the main line and the realization of projects as the task to improve students' interest and enhance students' practical ability. While completing the project, students not only master the key and difficult points of curriculum knowledge, but also exercise their ability to solve practical problems, so as to achieve the goal of talent training [4] [5]. The project driven teaching method shows a clear goal for students. The process of project completion is the process of students' learning, and it is also the process of cascade application of knowledge.

2. DEVELOPMENT STATUS

In the process of engineering education certification, colleges and universities have also carried out corresponding reforms to the course. According to the characteristics of Java Web Course Teaching and learning, Liaoning University of engineering and technology puts forward a "chain" teaching mode of speaking while practicing and replacing speaking with practicing. It introduces the reform practice from the aspects of course teaching mode, comprehensive practical links and course assessment methods, and finally explains the effect of teaching reform from the situation of students' employment and participation in discipline competitions. The teaching reform of java web course takes full account of the needs of enterprises and students' career development, introduces real software projects from enterprises, implements the "chain" teaching mode, changes the way of course assessment, stimulates students' enthusiasm and enthusiasm for learning, and has achieved good results [6]. Under the background of engineering education professional certification, Henan University puts forward higher requirements for students' engineering practice ability and innovation ability. In combination with the requirements of engineering education professional certification for talent training, the teaching content and assessment methods of the course should be reformed to make the course pay more attention to the cultivation of students' practical ability. The implementation effect of teaching reform shows that students' ability to solve complex engineering problems and innovation ability have been significantly improved, and good teaching results have been achieved [7]. Aiming at the current situation and problems of Java Web programming teaching, Qufu Normal University puts forward a penetrating case teaching method to comprehensively discuss the design and

implementation of cases. The case runs through the whole teaching process in a task driven mode. By constantly improving the function of the case, multiple knowledge points are connected into a line to fully mobilize students' enthusiasm and cultivate students' comprehensive ability to develop enterprise level projects [8]. In view of the problems existing in the current experimental teaching of programming courses, Central South University for Nationalities proposes to adopt the method of project teaching in the experimental teaching of Java Web programming, gives the content, form and course assessment method of the experimental teaching of this course, and points out the advantages and disadvantages of using the project teaching method in the experimental teaching [9]. Taking the Java Web programming course as an example, Henan University proposed that for the development of technology courses, the needs of teaching cases should be clarified according to the positioning of the courses in the training program, the specific forms and main functions of teaching cases should be designed according to the needs, and the corresponding course teaching methods should be planned. On this basis, the teaching cases should be realized and the case teaching methods should be implemented into the teaching plans [10]. The course "Java Web Programming" of Inner Mongolia University is offered in the multimedia classroom, mainly using the mixed teaching mode of online and offline; The "Java Web Programming" course of Inner Mongolia University of Finance and economics is taught in the computer room. Cases are introduced into the course, and the teaching method of speaking and practicing is adopted.

It can be seen that many colleges and universities in China have reformed the teaching methods, experimental contents and modes, teaching aids and other aspects according to the characteristics of the "Java Web Programming" course, with the purpose of improving students' interest in the course, improving the learning effect, and focusing on improving students' ability to solve practical problems. But these reforms are basically a project run through or school teacher guidance, without combining the two.

In order to thoroughly implement the spirit of the National Education Conference and the undergraduate education and teaching conference of Inner Mongolia University of technology, vigorously promote the reform of higher engineering education and improve the quality of engineering education, our university promoted the deployment of engineering education certification in 2018, and required to take the engineering education professional certification as the starting point to improve the professional construction level and talent training quality; Take improving the talent training program as the starting point, and earnestly do a good job in benchmarking construction. In the same period, all engineering majors have begun to apply for engineering education certification.

In order to further improve the professional construction level and improve the quality of talent training, the software engineering major of our University launched the engineering education certification in 2018. According to the school positioning and social needs, clarify the training objectives of the major itself. At the same time, with the continuous deepening of the concept of engineering education, formulate graduation requirements and index points that meet the training of professional talents. On this basis, take the improvement of students' ability as the goal, and re integrate the curriculum system. On the basis of clarifying the teaching objectives of the courses related to software engineering, we optimized the teaching contents, strengthened the practical links, and organized relevant teachers to compile the curriculum standards. In the teaching process, they also actively explore and implement the standards of engineering education certification. In order to improve the teaching effect, the project driven teaching method is introduced into the course of "Java Web Programming", and the project driven teaching mode of "one body, two wings and three stages" is proposed.

3. CONSTRUCTION OF PROJECT DRIVEN "ONE BODY, TWO WINGS AND THREE STAGES" TEACHING MODE

3.1. Project Driven Teaching Principles

Project driven teaching method is a teaching method that takes students as the center, takes projects as the carrier, and allows students to complete projects under the guidance of teachers. The main goal is to let students learn in practice, so as to achieve the goal of mastering knowledge and skills and cultivating practical ability. [11] Project driven teaching takes the familiar and relatively simple projects of students as the carrier of teaching, guides students to analyze the projects, then decomposes the projects into relatively independent functional modules, and leads to the theoretical knowledge and skills needed to realize the functions of the project. Each class iteration completes the function module and finally realizes all the functions of the whole project, so as to stimulate students' interest in learning and improve their practical ability, so as to achieve teaching goals.

1) Project Design

In the project driven teaching, the project runs through the whole teaching, so the design of the project is the key of teaching, which directly affects the realization effect of teaching objectives. The design of the project should focus on the teaching objectives of the course. The teaching objective of the course determines the ability that students should have after learning a course. It not only defines the intention and direction of teaching and learning, but also provides a basis for formulating teaching means and methods. Therefore, we should carefully design projects so that students can not only master theoretical knowledge, but also exercise practical skills, and play a role of bridge for them to achieve their goals. The design of the project should cover all knowledge points of the course as much as possible. The theoretical knowledge of the course is the theoretical support for students to master practical skills. It is not the knowledge stored dryly in memory, but the knowledge that can be flexibly applied to practice and solve problems. The design of the project should also consider the actual situation of students. Choosing projects that are moderately difficult and common can effectively stimulate students' interest in learning and constantly gain a sense of achievement in their learning process. If the project selection is not appropriate, students are not interested and do not have the initiative to participate, then the project driven will lose its original meaning.

2) Project Breakdown

As a project throughout the teaching, we should not only consider the overall teaching objectives and teaching contents, but also consider the teaching objectives and teaching contents of each teaching unit or class. Therefore, we need to decompose the large project into several sub tasks, so that students have clear tasks in each class and can apply knowledge in practice. The division of subtasks should be relatively independent. At the same time, it should start from local knowledge, gradually expand to overall and comprehensive knowledge, and effectively combine theoretical knowledge with practice by completing subtasks. The function of the subtask itself can be expanded or improved with the deepening of knowledge. For example, when implementing a function, it is cumbersome to use the newly learned knowledge, but the knowledge involved is relatively simple and easy for students to accept. With the continuous accumulation of new knowledge, it can be improved. In this way, the function is relatively perfect, the knowledge is gradually enriched, and the implementation is simpler. Subtasks can be related to each other, which is the extension of subsequent tasks to the previous tasks, or they can be independent of each other, which is the comprehensive application of the learned knowledge

by subsequent tasks. Each sub task should be visual and operable, which can completely show the operation effect, so that students have clear references and learning goals. Project driven is a method and a means. The purpose is to master and apply knowledge. Therefore, functions can be increased or decreased appropriately according to the coverage of knowledge points.

3.2. Project Driven "one body, two wings, three stages" Teaching Mode

The OBE concept emphasizes the guidance of students' output, so it is first necessary to formulate curriculum objectives and point out the achievements that students can obtain after learning this course. Then, according to the teaching objectives of the course, the teaching content is divided into three levels: classroom teaching, experimental teaching and project development, forming a project driven teaching system based on the knowledge system, with the task of project decomposition as the main line, supported by the project, and promoted by the expansion project. As shown in Figure 1, the teaching mode of "one body, two wings and three stages" is constructed based on curriculum knowledge and project driven. Integration refers to taking students as the main body; The two wings refer to the dual guidance of school teachers and enterprise teachers. Among them, school teachers guide students to complete teaching projects, and students complete teaching projects through imitation and rewriting procedures. Enterprise teachers help students complete development projects; The three stages refer to classroom teaching stage, experimental teaching stage and expansion project stage. Classroom teaching mainly takes the login task in the teaching project as the main line, connecting the knowledge points of the whole course.

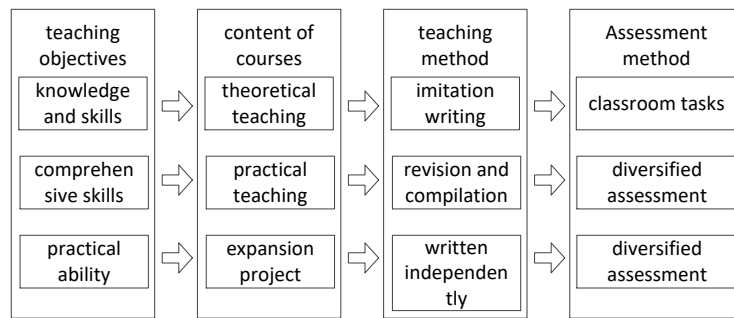


Figure 1. Curriculum teaching system

In project driven teaching, teachers transfer knowledge by completing projects and solving problems in projects, and transfer the methods, means and ideas of applying knowledge to solve problems, so that students can clarify what to do in the process of solving problems, that is, to clarify learning objectives and tasks; And master how to do it, that is, the knowledge and scheme design used to solve the problem; Understand why to do this, that is, the principle, and think about how to do it better, so that students can explore better and more perfect solutions. There are two kinds of projects in project driven teaching, one is teaching project, which is the project that teachers explain and lead students to complete during class, and the other is expansion project, which is completed by students independently. Project driven teaching method takes subtasks as the carrier and combines teaching units. The overall teaching process is shown in Figure 2.

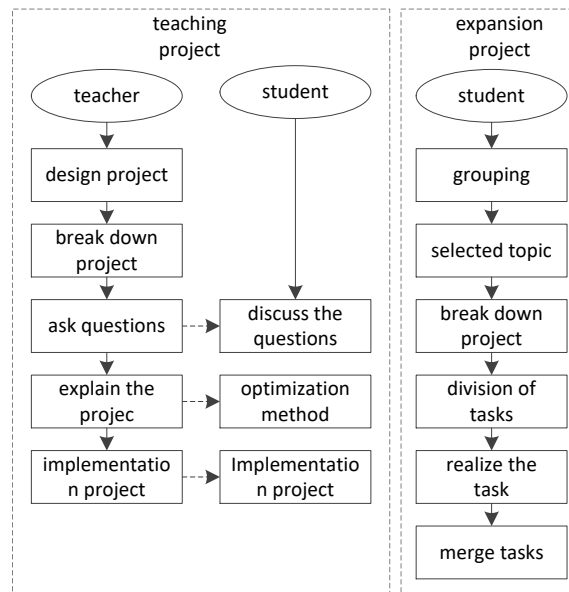


Figure 2. Project driven teaching process

4. IMPLEMENTATION OF PROJECT DRIVEN "ONE BODY, TWO WINGS AND THREE STAGES" TEACHING MODE

"Java Web Programming" is a comprehensive and practical course, which involves basic knowledge such as servlet, JSP, java bean, El, JSTL, etc. at the same time, it also integrates the knowledge of Web front-end technology, object-oriented programming, database application and other courses. Therefore, the course of "Java Web Programming" has formulated the training objectives of the course from the aspects of knowledge, skills and comprehensive ability, and determined the course content, teaching methods and assessment methods according to the course objectives. In order to effectively integrate knowledge and exercise practical ability, the course changes the previous way of teaching in multimedia classrooms, arranges all the contents of the course, such as theoretical teaching and experimental teaching, in the laboratory, and adopts the teaching method of "project driven, teaching and practicing".

4.1. The Teaching Method of "Project Driven and Combination of Teaching and Practice"

Under the project driven mode, two types of projects are designed, namely, teaching projects and expansion projects. Taking a basic user information management system as an example, the teaching project runs through the whole process of teaching, and according to the course knowledge points, the project is divided into several sub tasks, so that these sub tasks are complete and can cover all parts of the knowledge points. In the teaching process, the project is divided into three modules: user login module, user information display module and user information modification module. The information modification module is divided into four sub tasks: adding user information, modifying user information, deleting user information and searching user information. Among them, user login runs through the whole theoretical teaching process, and the other five tasks are the tasks of experimental teaching.

In this mode, the course content is integrated into four modules, including an environment configuration and eight technologies, and each technology corresponds to a user login task. The user login module runs through the classroom teaching, and different versions of login tasks

correspond to different teaching contents. The login task of each version is the improvement and perfection of the previous login task. The user information display module and user information modification module are completed in the experimental teaching link. At the end of the course, students also completed the study and practice of the whole project. The specific project tasks and course contents are shown in Figure 3.

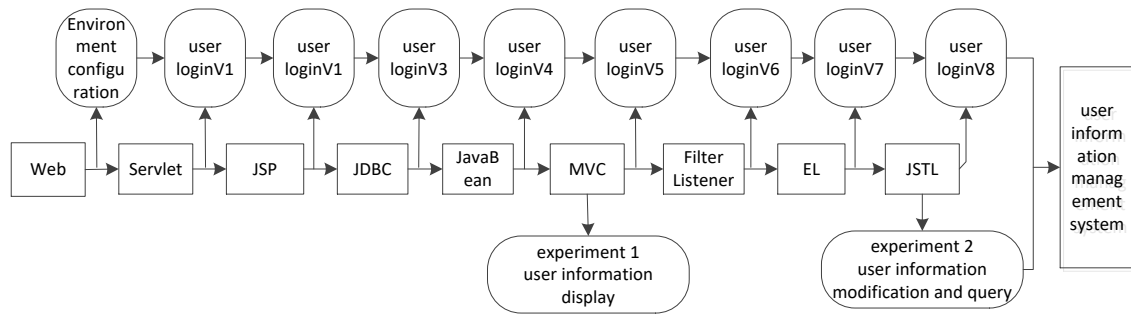


Figure 3. Project tasks and course contents

Due to the differences in students' knowledge and experience, there will be different degrees of understanding in the process of receiving new knowledge. Teachers should allow the existence of such differences and teach students in accordance with their aptitude. This course adopts layered teaching for students at different levels of knowledge and ability, one is the layering of technical difficulty, the other is the layering of expansion projects. stratification of technical difficulty. When realizing the function of the teaching project, we can use different technologies of the course content, and let students use relevant technologies according to their own situation. When the function of the project is realized, it will stimulate students' enthusiasm. stratification of expansion projects. In the implementation of expansion projects, different tasks are assigned according to students' ability differences. Students with strong ability can complete multiple tasks and difficult functions; Students with weak ability can assign fewer tasks, or even functions in similar teaching projects, and master the most basic skills through repeated practice.

Give full play to the role of "double tutors" of schools and enterprises. Based on project driven, students play an active role in teaching activities, and school teachers and enterprise lecturers jointly play an auxiliary role in teaching activities. Students form teams freely to conceive, design and implement the project development. Teachers guide and support the whole project development project, and imperceptibly teach students the skills of actively acquiring knowledge, analyzing problems and solving problems in the process of project development. Organizing teaching activities in this way is conducive to giving full play to students' subjective initiative, cultivating students' ability of teamwork, autonomous learning, and actively analyzing and solving problems. Finally, the teaching purpose of cultivating students' ability to acquire knowledge rather than inculcating knowledge is achieved.

4.2. Teaching Effectiveness

The "one body, two wings and three stages" teaching mode run through the project has been applied in software classes 18-1,2. As can be seen from Figure 4, compared with the traditional software classes 18-3, 4, the proportion of high scores has been significantly increased, and the proportion of low scores has significantly decreased. Through the follow-up survey of the pilot class, the feedback results show that the new teaching mode has exercised the students' practical ability, communication ability and comprehensive application ability of knowledge, and the comprehensive ability has been improved.

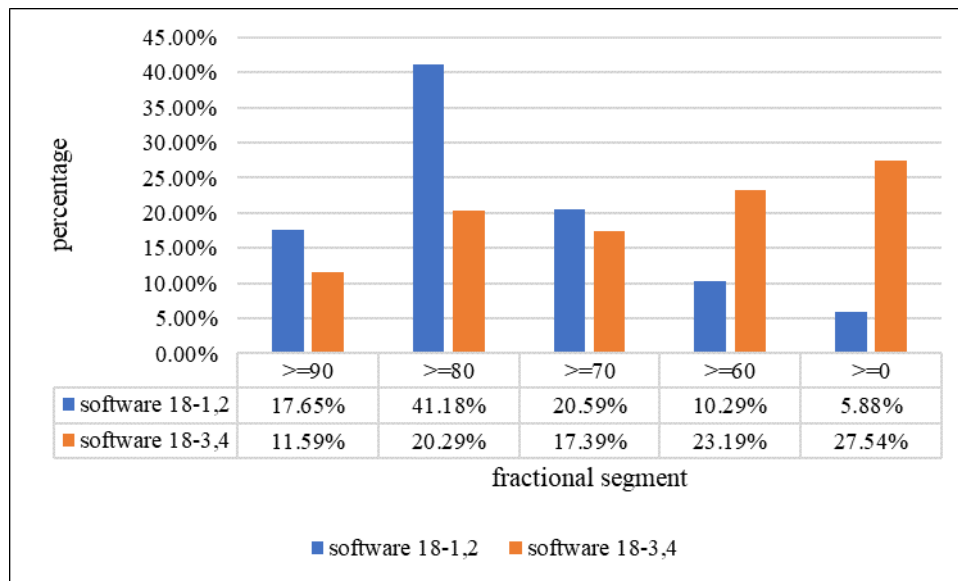


Figure 4. Comparison of teaching effects

5. CONCLUSIONS

This research topic takes the course construction of "Java Web Programming" as the research object, mainly for undergraduate students majoring in software engineering in the school of data science and application. Later, the course team will summarize experience and combine the feedback results to form a more perfect teaching method, which will be promoted to other professional courses. Since the teachers of the course group also undertake courses of network engineering and other majors, and subsequent majors such as big data technology and artificial intelligence will also offer this course in succession, the relevant teaching methods can also be extended to the teaching of students of relevant majors.

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