Teaching Reform of JavaEE Course for Software Engineers

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Abstract: The JavaEE course is a professional course that focuses on training students' software development capabilities and software development practices. With the development of information technology in China in recent years, there is an urgent need for a large number of high-quality software development engineers and maintenance technicians in China's economic market. However, the current JavaEE curriculum has the disadvantages that the course system is backward, the course is not practical, and there is a gap between the teaching content and the needs of the enterprise. Therefore, the teaching reform and the construction of teaching system of the JavaEE course should be based on the technical needs of software engineers in current enterprise. This paper mainly analyzes the main problems in the current JavaEE course, and puts forward the teaching reform ideas based on the combination of knowledge and practice. It introduces the specific approaches of course reform from the aspects of course system, teaching mode, evaluation method and the construction of teaching staffs.

1. Introduction

The JavaEE course is a comprehensive course that involves a variety of knowledge such as databases, Java language programming and Web application development. Through the course, students will learn the basic knowledge of developing Web system using JavaEE technology, form a systematic understanding of the Web system and be able to independently complete software development using JavaEE technology. However, in the actual classroom teaching, we have to face up to the problems that there is a big gap between the course teaching and the actual needs for software development engineers in enterprises and there is a huge gap between students' theoretical knowledge and practical ability. Therefore, in order to further meet the job requirements of software development enterprises and improve students' professional competitiveness, the teaching reform of JavaEE course should be based on the actual work requirements for software engineers, and the case teaching and task-driven teaching modes ashould be applied to the course teaching to form an innovative and comprehensive teaching system and to improve students' ability to solve practical problems.

2. The historical background of the teaching reform of JavaEE course

The development of information technology such as computers and the Internet has promoted the arrival of the "Internet +" era. The software development market has continue to been expanded, and higher technical requirements have been proposed with the advancement of the times. In the computer industry, the job demand of JavaEE software development engineers is very huge, which becomes a new breakthrough point in the future jobs competition and personnel training. However, in the actual investigation on computer-related enterprises, it is found that enterprises are more inclined to recruit technical talents who can directly meet the needs of software development jobs. And there is a big gap between the relevant students major in computer and the actual job needs of enterprises, which is at a disadvantage in jobs competition. In order to meet the actual job requirements of the computer industry, the teaching of JavaEE should be innovated and reformed to further improve the jobs competitiveness of graduates.

The basic job requirements for enterprise software engineers include: be proficient in development tools such as Java language and SQL language, be skilled in applying web

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development technologies such as Servlet and JSP, be well known of development frameworks such as Struts, Spring and Ibatis, be proficient in frameworks such as Ajax and jQUERY, And be experienced in developing application servers such as WebLogic and Tomcat[1].

The current JavaEE courses in the school mainly include the basic knowledge of JavaEE language, common classes of Java libraries, JavaWeb development technologies such as JSP and Servel, and JavaEE technologies such as JPA and EJB. It can be found that the current teaching content of JavaEE course is not completely consistent with the actual job requirements for software engineers, correspondingly, it lacks some mainstream development frameworks and technologies and frameworks such as Ajax and JavaScript through the contrast. Although the current school teaching has improved the practical teaching of the JavaEE course, due to the influence of the course practice and the system arrangement, there is a big disparity between it and the actual project of software development in enterprises. The various factors lead to the low level of software development of students. And it is difficult to meet the direct job needs of enterprises.

Therefore, the teaching reform of the JavaEE course in school teaching should be based on the actual job requirements for the software engineer. It is necessary not only to make a comprehensive structural adjustment of the teaching system and course offered of the JavaEE course, but also to make appropriate innovations and optimization in teaching methods, teaching modes and teaching content.

3. Reforming the JavaEE course system based on the requirements for software engineers

3.1. Thoughts on reforming course system

The reform of JavaEE course for software engineers should include the main JavaEE technologies needed by enterprises. The course system should include a total of 6 knowledge courses of "JavaEE Programming", "Database Technology", "Servlet/JSP Programming", "CSS and JavaScript", "JavaEE Framework" and "JavaWeb Development Technology", and a total of three training courses of "Practical Training" , "JavaWeb Training" and "Servlet / JSP Training"[2]. Compared with the previous JavaEE course, the scope is broader and more knowledge is contained, and the mainstream technologies and frameworks of software development are included. Moreover, they are related to each other to form a complete and comprehensive knowledge system, and to form a JavaEE software engineering course system based on actual job requirements through the training courses combining knowledge and skills. And the increase of the training courses can consolidate and train the knowledge acquired in the six knowledge courses, and can combine various professional knowledge. Students can effectively develop their own ability to development project in the training course, thus forming a clear rational understanding of software development. The addition of practical courses can effectively improve students' capabilities to develop software project, and increase the comprehensive practice of software projects based on software system analysis and software design courses. These practical courses that need to be practised in the laboratory not only put forward certain requirements for the project analysis and design ability of students, but also require students to be able to encode, thus making up for the shortcomings of the traditional practice courses. Students can actively use Java, SQL language and other framework knowledge to complete relatively complete software projects.

3.2. The scientific teaching method

The traditional teaching methods for JavaEE course can be appropriately innovated and reformed to cultivate and enhance students' capabilities to develop projects. The combination of case teaching method and task-driven method makes the classroom teaching more practical and can be meet the actual needs of enterprises.

First of all, in the case teaching method, the teachers select the project suitable for the student's academic situation according to the actual needs of enterprises, and combine the project with the knowledge learned by the students, decompose the project according to the curriculum knowledge system, and decompose the comprehensive project into small projects to form small cases[3]. Then

the teacher guides the students to complete the modules of each case when analyzing and teaching the small cases. The case teaching method is more flexible, and the teachers can select the actual project to show the case effect, then decompose the project and explain the related knowledge. Students can consult relevant books and documents on their own according to the knowledge taught by teachers, forming cooperative groups and solving problems together to complete the case module.

For example, a simple problem can be proposed with a small case. The teacher explains the solution and demonstrates how to write the code. The students can write the code according to the teacher's steps. The teacher analyses and explains the knowledge points for the students to ensure that the students master the basic steps and principles of the technology he teaches.

Then, the advanced case is introduced according to the first small case. The teacher selects a new case or an unresolved problem in the previous case to introduce new knowledge and new methods, and to explain related knowledge. Then the students are allowed to solve the new case or the unresolved problem in the previous case. The students will further deepen their understanding of the basic principles of the previous technologies they have learned, and try to learn after class to look up information to gradually learn the relevant technical details, thus to be proficient of the method to modify the code.

Secondly, in the experimental teaching method, each module is set a learning goal, then the teacher sets relevant experimental projects according to the learning objectives, students are given the opportunity to write their own code in the lab and are asked to write experimental reports. Students will experience and know the technical principles through experiments and consolidate the knowledge points in the textbooks. When designing an experimental topic, the teacher can choose the case teaching or business project scenario that students are familiar with and related to the actual needs of enterprises. For example, teachers set up the experimental project of "Counselor Information Management Module" based on the development project of "Enterprise Information Management Module". The difficulty in developing this kind of similar project is not much and it is related to the actual business in work. Students can do experiment directly using the techniques learned in the case study to gain a successful experience.

Finally, in the task-driven approach, teachers can lead students into the learning links of a combination of project development and task-driven after the case teaching and experimental teaching. Teachers can ask students to form study groups and to choose Web development projects as tasks on their own. After the case and experiment teaching of each module, sub-tasks related to the technologies and principles learned should be set. The team is responsible for completing the sub-tasks and answering questions. After the sub-task, the team will submit the results of the mission and report on the project. And teachers and other teams can assess the results of the team in a quantitative and qualitative way[4].

In the process of group tasks, personal task projects can also be developed. Students set up tasks independently according to the content of teaching and independently develop small Web projects. Students can choose less difficult projects based on their own learning situation, or they can choose projects related to group tasks. In personal tasks, students must complete the chosen projects independently, including titling the projects, independent analysis, designing framework, coding, programming, etc. After the project is completed, it is necessary to compile and submit materials such as project analysis and database specifications. Show or present project results in front of the class. A judging panel consisting of teachers and students conducts a comprehensive assessment on student performance.

3.3. A scientific and comprehensive evaluation system

The innovation and reform should be made for the evaluation method in the course evaluation. Multiple-evaluation should be adopted to enable students to play an evaluation function while serving as a learning subject, and to highlight students' responsibilities in the learning process to stimulate their enthusiasm and initiative. In the evaluation process, teachers can use a variety of methods such as teachers evaluation, groups evaluation, students evaluation or autonomous

evaluation to comprehensively evaluate students' learning activities and project completion from various aspects and perspectives.

First, use the summative evaluation cautiously, but focus on the learning process and methods. Attention should be paid to the students' learning behaviors and the various learning abilities, potentials, learning attitudes and value orientations displayed in the learning process in evaluation behaviors. A comprehensive understanding of students' learning behaviors and learning thoughts can be obtained in this way to make targeted guidance and corrections to improve students' learning efficiency and quality.

Secondly, in the formative evaluation, it is necessary to combine the immediate evaluation with the timely evaluation, so that students can fully learn the value of the learning behavior that is taking place and make changes and progress in their own learning attitude, learning behavior and cognitive level after a period of study.

Finally, the proportion of achievements should be laid stress on when evaluating. Due to the strong application of software engineering, teachers can combine the evaluation and project learning methods when evaluating. The teacher evaluates the student's independent completion of project from the concept design, software analysis, product demonstration and program ideas, with a proportion of 70%. Students or groups then evaluate each other. This process is mainly for students to use PPT for project presentations and explanations, to share ideas and opinions to students, and evaluations are given by other groups or other students. This process occupies 20%. At last, teachers make a comprehensive evaluation according to the students' enthusiasm, initiative, innovation and inquiry in group activities and personal projects, as well as students' ability to independently look up information after class. Students' emotions, thoughts and attitudes in learning behaviors are laid stress to evaluate students, and the proportion of this process is 10%.

3.4. A scientific and personalized teaching team should be built

JavaEE courses for software engineers cannot follow the same teaching model. Then the school can also make corresponding reforms and innovations in the teaching team to develop and activate new teaching models. The current software engineering discipline is relatively mature and has a certain scale of teaching echelon. Such as software system design, analysis, software engineering overview, software testing, software framework design, etc. In software engineering teaching, teachers should also continue to learn and improve their professional knowledge and teaching capabilities. Therefore, the school can also build a personalized and scientific teamwork teaching model based on the actual needs of computer-related enterprises and the requirements for software engineers[5]. For example, teachers regularly organize teaching seminars, set different teaching groups according to the courses taught in software engineering, prepare lessons in groups, and regularly discuss and agree on the teaching content, teaching system and teaching sequence within a certain period of time, thus combining multiple courses and disciplines to form an auxiliary to avoid duplication, overlap and conflict between courses.

4. Conclusion

In short, the teaching reform of the JavaEE course must not only conform to the teaching rules of the course, but also meet the actual job needs of enterprises for software engineers to adapt to the vocational development needs of the enterprises. Therefore, in teaching, schools should not only reform the course system, pay equal attention to knowledge and skills and introduce the real project of the enterprises into the classroom, but also should innovate the teaching philosophy, mode and teaching methods of the teachers to effectively solve the problems in current JavaEE course teaching.

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