Discussion on the teaching method of software testing and quality assurance course based on the integration of school and enterprise

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Abstract: In view of the difference between the training goals of students and the needs of enterprises in the software testing and quality assurance course, this paper puts forward the teaching reform of software testing and quality assurance course by the integration model of school and enterprise. Based on the evaluation standards of software enterprises, this paper explores the teaching strategy design, syllabus planning and teaching content deployment, evaluates the effect of the school-enterprise integration mode through diversified assessment, so as to form a closed-loop management of the teaching and training mode, which is conducive to the continuous improvement of course teaching and meets the needs of enterprises for talents.

Key words: school-enterprise integration; Software testing and quality assurance; Curriculum system

Introduction

In China, the software industry has experienced a growth rate of 28% in the past five years, which is three times the growth rate of the national GDP in the same period. The software industry has entered a period of rapid development and has become a sunrise industry in all industries. Software has now provided support for transportation, finance, disaster warning, production scheduling and other core fields, which are related to production, life and even life safety, so the quality of software products has strict requirements. The quality of software is not only determined by the quality of the final product, but also needs to pay full attention to the quality of the process, which is the original intention of the course of software testing and quality assurance.

1. Current status of software testing and quality assurance courses

There are a large number of concepts, models, norms and other contents in software testing and quality assurance courses, which are analyzed, summarized and refined by[3-4] experts, software development companies and even experienced programmers. However, for students who lack actual project development experience, it is difficult to experience prior experience in software development, and it is difficult to understand the essential meaning and differences among them. They are more mechanically memorized, and will not apply these knowledge to actual software development; In the part of testing, the testing focus and methods adopted by students for each test link are only limited to the simple testing methods introduced in class, lacking the overall test plan of the actual project and the consideration and design of test cases. However, software enterprises need students to have solid professional knowledge, higher testing skills and rich testing experience, so they need to train students on the basis of actual software development background, strengthen students' understanding of theoretical knowledge, exercise practical ability, guide students to solve practical problems, and become talents with excellent professional skills in software testing.

2. Teaching exploration of integration of school and enterprise

CMM is a universal software evaluation standard, which is used to evaluate and improve software development process and software development capability, and help improve software quality. As a set of effective software development process guidance standards, CMM provides an effective means for software enterprises to achieve business objectives, so many software enterprises apply CMM in actual software projects. Taking CMM as the development standard enterprise's requirements for personnel as the starting point, the graduation requirements of software engineering students are determined. The teaching team constantly tries to adjust the course outline and teaching content, aiming at cultivating students' comprehensive software development ability.

(1) Adjust the professional training mode according to the graduation requirements of software engineering students

At present, the development of the training objectives of software engineering in our college starts from the aspects of student development, school positioning, IT industry development and workplace needs, as well as national social and educational development needs, and in-depth analysis of the links between these four levels: School positioning is the basis of the development of training goals, national social needs are the ultimate goal of training goals, and professional positioning and IT industry needs are the guarantee of meeting social needs, so starting from the development of students to develop training goals covering the key characteristics and core competence requirements of software engineering graduation requirements. The basic principle of the new training model of software engineering is to reflect the "professional system" and strengthen the demand for innovation. The advantages of this model are comprehensive training of students' professional skills, double improvement of engineering practice ability and innovation ability, wider export of students, and gradual improvement of students' employment rate and employment quality.

(2) Planning the teaching syllabus based on the training model

Based on the output-oriented concept, the course team investigates the needs of enterprises, tracks graduates, analyzes the gap between graduates and the needs of enterprises, locates the problems from the gap, comprehensively measures the training plan and training objectives of software engineering majors, adjusts the teaching content, and re-plans the course syllabus. The syllabus includes the nature

and teaching objectives of the course, the graduation requirements supported by the course and the specific observation points, the support of the graduation requirements and indicators supported by the teaching content of the course, the assessment method and the grade assessment, the course evaluation and improvement. The syllabus is the main basis for writing textbooks and teachers' teaching, as well as an important standard for checking and evaluating students' academic performance and measuring teachers' teaching quality. On the basis of formative evaluation and summative evaluation of teaching, teachers and enterprise experts shall be organized by the person in charge of the course group, and adjusted according to the feedback information of employers and graduates, so as to formulate the syllabus

(3) Design the teaching content based on the teaching syllabus

Software testing and quality assurance Most of the teaching materials on software quality assurance models, standards, software testing theoretical knowledge, testing methods and other content are introduced in detail, such as learning McCall model, Boehm model, FURPS model, ISO 9126 model and other quality assurance models. However, students have difficulties in how to apply the model to actual software projects. Therefore, in terms of teaching content, the previous way of emphasizing theory and concept should be changed, and the principles of software development industry should be incorporated. Based on the actual projects of enterprises, the teaching content related to it should be reconstructed to improve the authenticity and interest of the class, immerse students in the real development process, enhance their participation and enthusiasm, promote their courage to practice and positive thinking, and stimulate their potential.

The teaching content of the design is as follows: programming technology, code style, code review, black box test, white box test method and other contents require students to pay attention to high-quality programming in the coding process, according to different test requirements and problems, use different techniques in black box and white box test method to design test cases; The software quality assurance model and the understanding and estimation of the defect elimination efficiency of the process capability measurement require students to understand the software quality characteristics in the software measurement, and use the defect elimination efficiency to measure the filtering ability of quality assurance and control activities; The concept of software reliability and the evaluation criteria of software reliability require students to master the definition of software reliability, the estimation of the mean time of software failure and the relationship with the residual errors in software and software scale. Software quality engineering system, the common methods of software quality control, the purpose, process and principle of software testing and the management of the test process all require students to master the basic methods of software quality control, the process, purpose and principle of testing, the application of different testing strategies in different testing stages, and the composition of the test management system. Software review, defect classification and grade confirmation all require students to master the process management methods of test management, test plan formulation and defect management adopted in each stage of the engineering project life cycle; The development and meaning of the concept of total software quality and the method of defect management require students to master the relationship between Deming ring, total quality management and complete customer satisfaction in total quality management.

(4) Establish a university-enterprise joint teaching team based on the teaching content

The school teachers have a solid theoretical foundation, and the enterprise experts have rich engineering experience. The curriculum team fully combines the advantages of both sides to establish a school-enterprise joint teaching team. According to the training objectives and teaching outline, the teaching process first arranges teachers of the college to organize the learning of theoretical knowledge combined with test application cases, and then combines senior enterprise experts to teach students in the classroom. Using CMM as the development guidance framework, students can feel the process of software development and testing in the enterprise environment. At the same time, students can complete the comprehensive practical training project of enterprise by hand. Thus, the practical ability of students is greatly improved. In each class, the school-enterprise teaching team is deployed to take on different responsibilities from before, during and after class. Before class, the school teachers mainly release preview tasks in the class, and release course videos and other learning resources through the class. In class, teachers or enterprise experts make students become the leaders of teaching by flipped classroom to improve students' participation in class. After that, teachers or enterprise experts analyze and summarize the important and difficult points of the course according to students' situation; After class, after completing the practical tasks, the students upload the results to the pan-ya classroom, and the teachers/enterprise experts correct the mistakes according to the completion, and give comments and suggestions.

(5) Implement diversified curriculum assessment based on training objectives

The traditional paper examination mainly focuses on theoretical knowledge points and lacks the examination of practical application. The only test results in students' neglect of engineering practice skills. Each task in the whole practice link is just a formality, and there is no initiative to analyze and solve problems independently; Lack of awareness of the important role of software quality assurance and software testing in software projects. In order to cultivate students' professional quality and practical ability, the assessment content involves not only software quality assurance model application, test case design and software quality measurement, but also comprehensive ability evaluation such as case analysis and code analysis, so that students can exercise their ability to analyze real cases and solve practical problems; Students' use of commonly used test tools is the focus of the practical operation assessment, and the practical engineering ability of students is trained through the practical operation assessment. The diversified assessment makes a comprehensive evaluation of the students' curriculum knowledge, and promotes the students to fully develop their comprehensive ability at ordinary times.

(6) Continuous improvement of the school-enterprise integration training model

In the whole school-enterprise integration mode, the overall teaching management is achieved through various internal and external circulation mechanisms such as adjusting the training mode, standardizing the course outline, designing the teaching content, improving the teaching method and reforming the assessment method. Then, according to the training objectives, the teaching output goal is set, the course

performance goal is described, and the learning situation of students is evaluated, from teaching management to evaluation. And then from evaluation to teaching management, the continuous improvement of closed-loop management is realized. Through the study of software testing and quality assurance courses, students can first correctly understand the relationship between this course and other courses, and understand the factors affecting software quality: management, technology, personnel and so on. Adopt the teaching mode of integration of school and enterprise, take the output as the orientation, pay attention to the cultivation of students' ability, and strengthen the monitoring and management of the whole process of students' learning. After the reform in recent years, students' awareness of project management, high-quality coding ability and software automated testing skills have been exercised, which provides a good foundation for the follow-up course design and graduation design.

3. Epilogue

In the mode of school-enterprise integration, software testing and quality assurance courses based on real enterprise projects are set up to cultivate students' practical application ability, so that students can understand how to ensure software quality in the whole process of software development and implement software testing operations in real project development. Thus, in the classroom, the repeated use of "teaching, learning and doing" in one way, to achieve the effective combination of "learning to do" and "learning by doing", stimulate students' interest in learning and enthusiasm for learning, improve students' initiative in learning, and enhance students' practical ability to solve problems. In the follow-up teaching, continue to improve the gap between the needs of students and enterprises, and further enhance the adaptability of talent training.

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