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The Research of Software Engineering Curriculum Reform

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Abstract

With the problem that software engineering training can't meet the needs of the community, this paper analysis some outstanding reasons in software engineering curriculum teaching, such as old teaching contents, weak in practice and low quality of teachers etc. We propose the methods of teaching reform as guided by market demand, update the teaching content, optimize the teaching methods, reform the teaching practice, strengthen the teacher-student exchange and promote teachers and students together. We carried out the reform and explore positive and achieved the desired results.

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Keywords: Software engineering; Higher education; Software professional; Teaching reform; Teaching mode.

1 Introduction

Software engineering is the methodology which apply computer science, mathematics and management science principles to software development projects. Its goal is to make education and training learners to understand and master the software development methodologies and engineering knowledge, and applied in practice [1]. Software engineering emphasizes the systematic, operability and reusability in the process of software design and development. In this subject characteristic, traditional teaching of software engineering is lack of the linkage between theoretical mastery and practice skills development. In addition, software engineering is a rapidly developing discipline, especially in the programming language, software development and design tools, software reuse technology, design patterns and other fields, but current materials and teaching content, knowledge structure, and practice have so serious shortcomings, which restrict the effect of the teaching of software engineering [2] [3]. Therefore, It is urgent need to reform curriculum, enable students to master the basic software engineering principles and methods, and can effectively resolve engineering problems.

2 The Talent of Software Professionals Can Not Meet the Social Need

A lot of the grassland and strong software professionals is urgently required in our community. However, there is always a vicious circle in computer science graduates: on the one hand employers feel that the software talent shortage, on the other hand a considerable number of graduates can not find a suitable position [4]. This is mainly because the quality of software professionals can not meet social requires. The phenomenon that these software professional graduates can not be good services for business is reflected in the following areas:

2.1 The contradiction between the old knowledge of students and the increasing technology demand of employers

The software industry is an emerging industry, software development tools and technology update quickly. However, most of our software training institutions have been teaching graduates relatively old knowledge systems. It is difficult to adapt to the rapid progress of information technology needs.

2.2 The contradiction between students' lack practical experience in software engineering and enterprise applications talents demand

Software companies need a lot of experience with software engineering talent to develop software products. Companies hope that the new hires will be able to just a simple training posts to create value for the enterprise. However, most software professionals graduates only on paper, lack of practical experience, do not know how to solve specific engineering problems encountered, force companies to spend considerable time and funds to train new employees on technical for pre.

2.3 Students' lack of the concept of software engineering

Students' understanding of software engineering is limited to code. They believe as long as they master a programming language then software engineering capabilities are possessed. In enterprise standard, only one subject to the following four conditions, the practical ability is qualified.

Table1. the basic requirements of labour productivity of Software developers (unit: code rows per person and month) Type Size for Papers

VC	JAVA	VB	JSP
45k~90k	66k~90k	105k~135k	120k~150k

Table2. Minimum error requirements in different testing phase (Unit: piece per thousand rows)

Unit Test	Integration Test	System Test
6.8~11.6	7.0~10.6	1.6~3.6

- 1) The qualified actual code amount using a programming language to develop procedures for is more than 5000.
- 2) Labor productivity (programming plus Test) to reach the standards in Table I.
- 3) Programming must be strictly according to software engineering standards, for example, the code statute, the call of common modules and a document compiling.
- 4) The Programming quality (BUG rate) is less than the standard shown in Table II [5].

2.4 The lack of team spirit

While Students developing a project, the teamwork ability and communication among the other members of project team is not enough. And the existing workload and difficulty of software projects are large, project team members need to complement each other to complete.

3 Cause Analysis of Low Quality of Software Engineering Talent

The reason for the low quality of personnel training of software engineering is mainly related to the teaching patterns. By analysing current computer-related professional status of teaching software engineering courses, there are several reasons why the training software professionals out of touch with social needs.

3.1 Outdated curricula and teaching content

Computer technology has only a few decades, its development is extremely rapid, and software engineering technology and its tools is ever-changing, but the software engineering syllabus and curriculum for teaching content are constrained by the normative teaching plan and process, which often not adjusted and updated in a timely manner. It is difficult keep pace with the rapid development of software engineering technology [6]. On the other hand slow update teaching materials, old content, is difficult to reflect the latest cutting edge technology. These factors make the students learn in school is relatively old and outdated. These technology and knowledge can not meet the social and industrial development.

3.2 The insufficiency combination between Teaching theory and practice

The theoretical part of software engineering courses is very abstract and can not stimulate students' interest in learning. Unlike the theory of the role of some parts of other applications as "WYSIWYG", so it's hard to lift beginners' interest. The conflict between teaching and learning are revealed, some of the problems that teachers have made it very thoroughly, but the students receive the practical effect is not ideal. In current teaching, theory and practice is not ideal, the majority of the teaching are purely theoretical, the students listen to the theory of class terms, see the next lesson or theoretical terms, the students will gradually give up the course interest in learning by the passage of time.

3.3 The lack of engineering practice opportunities of students

Many institutions still belong to the closed or semi-closed mode, and do not pay attention to docking of personnel training and industrial needs. Because it is difficult for college to provide students the opportunity of software engineering practice, the students do most of small and virtual software projects, such as curricular experiments, curriculum design and graduate design. The knowledge of these practices comparatively covered small, and there is no demand for the background, meaning that no user would be to use the developed software, so students do not do the time in software development needs analysis, design and directly from the encoded; there is no testing and maintenance; the entire software development process is chaos; students absorb little essence of software engineering in these practices, but make a mistake ideal that software engineering is coding. In this mode the students are trained by the lack of practical training, and can not meet the needs of enterprises.

3.4 Faculty members lag behind

Many long-term work of teachers in colleges and universities do not understand the actual needs of society in general and are not familiar with software engineering, international standards and technical specifications; they lack of advanced theoretical level and practical experience in software development; the taught curriculum is old, and too much emphasis on theory, emphasis on basic knowledge of construction, in the practical aspects of teaching there is a big defect, which resulting in the training of students to solve practical problems is not strong, a direct result of education of a pupil is out of line with market demand.

4 The Reform to Improve the Quality of Software Professionals

For the above, in the current teaching resources and limited funding situation, We propose the methods of teaching reform as guided by market demand, update the teaching content, optimize the teaching methods, reform the teaching practice, strengthen the teacher-student exchange and promote teachers and students together. We carried out the reform and explore positive and achieved the desired results.

4.1 Guided by market demand, revised curriculum and teaching process

Computer software technology is constantly updated and developed. In order to enable students to adapt to market demand, universities must revise curricula based on the market required master skills for software professionals. Past few years, in Beijing, Shanghai, Guangzhou, Dalian, and the well-known enterprises, our school conducted field research to understand the needs of business professionals to master the latest technology trends, then adjusting the curriculum and teaching plans. For example, since 2008, a hot technology, Struts 2, has been open as elective course.

4.2 Optimization of teaching methods

Due to lack of practical experience in the development of software engineering, Students can't understand various parts deeply, as well as the internal logic of overall course; learning it was boring, a direct impact on teaching effectiveness. In order to mobilize the enthusiasm of the students in the classroom, teacher should emphasize the guidance importance of theory to practice, and improve students' awareness of software engineering. Just a touch of this course the application is emphasized and some successful examples of experiences and lessons of failure are introduced, so that students can feel where the usefulness of software engineering to enhance interest in learning, and set a good software engineering concepts. Since 2006, our school organizes teachers teaching regular seminars weekly; teachers exchange their teaching experience; at the same time the School Education Steering Committee was established, the teaching effects are scored each semester; score results directly linked with the post allowance; all of these encourage teachers to optimize instruction and improve the teaching level.

4.3 Strengthening the teaching staff

Strengthening teacher and teaching echelon formation, on the one hand the professional courses group organizes teaching seminars on a regular and observes the activities of teaching to improve teaching skills of teachers; the other hand, through training, education and other forms of accumulation of knowledge of teachers to promote teachers updating their knowledge, to promote the steady improvement of teaching quality. In raising the level of the existing teaching staff, our school has made a lot of work:

1) *Organizing two teachers each semester to go out training or education, learn the latest software technology.* After returning to school, they teach other teachers to master their learning content, learning outcomes reporting in teaching seminars;

2) *Regularly employ high talents of corporations to train for teachers in short-term;*

3) *Faculty members' lack of the practical experience of project development is the root causes of students' poor hands.* Institute of Scientific Research Group organized the teachers who have do not entered the establishment of project team to form project teams whose members' numbers is range from 5 to 7 people. These teachers to declare the actual preparation project from school to improve professional skills, and promote teaching. So that these poor hands teachers can from the actual project get exercise, and keep up with current technology development trends.

4.4 *Emphasizes the importance of practice teaching, and establishes the concept of software engineering*

Software engineering is a course whose theory is closed link to its practice. The only means of testing the effect of teaching is whether students really build up software engineering concepts in the implementation of large-scale software development activities and whether they can properly use of software development methods to improve software quality. In order to strengthen practice following methods are enforced:

1) *Revising teaching plans, arranging curriculum design as early as possible, increasing the hours of curriculum design, training students in the actual development capacity.*

2) *Taking part in projects involved the development of simulation training.* By selecting some true cases of enterprises cases as training program in advance, students in small groups simulate the whole process of research and development projects, so that students feel software companies work environment, work processes, corporate culture, and team spirit [5] .

3) *Taking part in projects involved in the actual software development to cultivate students' all-round comprehensive ability.* Only through participation in companies project development can truly understand the three factors (duration, quality, and cost) in enterprise software development projects.

5 Conclusion

Cultivating talents is an important social responsibility given to colleges and universities. Colleges and universities' mission is providing companies with eligible products: students. Guided by market demand, update the teaching content, optimize the teaching methods, reform the teaching practice, strengthen the teacher-student exchange and promote teachers and students together, to fulfil the teaching innovations of software engineering. All of these will have very important significance to ensure the high quality of personnel training of the software engineering.

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