Research on Hybrid Teaching Mode of Software Engineering Based on SPOC

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Abstract: With the advent of the information age, the new teaching mode is emerging, and the traditional offline course and online teaching are constantly integrated and updated. By using SPOC teaching method, it is integrated into the course teaching of software engineering, and the study of hybrid teaching mode of software engineering based on SPOC can effectively improve the teaching quality of teachers and students' learning efficiency, and promote the cultivation of talents.

1. Introduction
In recent years, with the continuous innovation of computer network technology, the educational teaching mode of colleges and universities is also in the rapid renewal and development, and more and more new teaching modes are emerging. As a traditional computer professional course, Software Engineering courses also need to step out of the traditional model of teachers' single teaching, and make use of modern teaching tools and teaching methods, and complete high quality teaching and a lot of learning content in a limited time.

2. Software Engineering
The course of software engineering is already an important professional course for computer and related majors in major colleges and universities. The course system of software engineering involves the definition of communication and the acquisition of demand with customers in the early stage, the software design and development in the medium term, and the software testing, operation and maintenance and other software at all stages of the whole life cycle in the later stage. Software engineering, as an important professional course in software engineering and computer related majors, has both strong theoretical and very high practicality. Through the study of software engineering courses, students majoring in computer science can master the basic professional ability needed as software practitioners, and provide theoretical and methodological guidance for all kinds of work related to computer software in the future. It can be said that learning software engineering well is a compulsory subject for both computer and its related professional practitioners.

Nowadays, the traditional software engineering teaching is often divorced from the actual project, mainly relying on the traditional mode in which a single teacher carries on classroom instruction and the students independently complete the homework. In the traditional mode, students' understanding of the curriculum is not sufficient, their autonomous learning ability is poor, the learning effect is difficult to feedback and other problems are particularly obvious, often there will be poor classroom effect, low efficiency, teaching quality is not high and so on.

On the other hand, due to the limitation of course time, the current software engineering teaching content mainly focuses on the basic knowledge of software engineering, that is, traditional software engineering. From the object-oriented methodology in software engineering, many new knowledge
methods, such as software modeling, building technology and so on, some of the current social popular software tools and methods, often involved in the shortcomings, it is difficult to fully meet the requirements of enterprises and colleges and universities for software engineering students, and even directly affects the late employment of students and the graduate examination. However, according to the curriculum arrangement of most colleges and universities, there is often the problem of insufficient class hours, many new knowledge points are often not in the regular school schedule. For example, the acquisition of requirements in software engineering, UML (Unified Modeling Language), software quality assurance, quality assessment, project management and other knowledge points in the course of software engineering are mostly involved, relying solely on software engineering hours to explain completely inadequate, students can’t understand, so students lack learning level, knowledge understanding is not enough, the learning progress lags behind, the learning effect is poor and so on.

3. MOOC, SPOC
MOOC (Massive Open Online Course), has been popular since 2012, there are a large number of MOOC learning sites and platforms both at home and abroad. MOOC courses have a complete set of teaching links: develop classes, begin classes, homework, feedback, discussions, evaluations, assessments, certificates. Unlike other traditional online courses, MOOC is a mode that teachers directly have classes for the listener, rather than looking at other people in class, students can communicate and share through the network, the schedule of the course is relatively free. Although MOOC learning only needs to be done directly through the network, students do not need to face each other with teachers, and there is no clear limit on the identity and number of students. But with it comes a series of teaching quality problems, such as the absence of a threshold for students to enter, the difference in student base, the imbalance of learning progress; Teachers can’t control students' learning situation by the simple online environment, so the learning efficiency is low; the openness of the classes is easy to let students lose the tension of learning, and the self-awareness declines, the completion of the study is low. In this form, the new teaching method SPOC came into being, and gradually gained attention.

SPOC, (Small Private Online Course), is raised by Professor Armando Fox from University of California in 2013. The meaning of Small in the SPOC is the scope of the class, where the number of students is controlled up and down hundreds of people. The meaning of Private is courses do not open on a large scale, and access conditions are set for courses, and the scope of the course refers only to some students. Taking advantage of such restrictions, we look forward to improving students' learning efficiency and course completion. The teaching mode of SPOC that adopts the teaching method of online and offline combination, classroom and online learning mixed is different from MOOC which is a kind of online teaching that relies entirely on the web.

The teaching mode of SPOC is the supplement and development of the mood of MOOC. That means the teaching mode of SPOC not only makes up the disadvantages of MOOC in the teaching classes, but also uses the teaching of offline communication into the teaching mode of MOOC. Taking advantage of MOOC video realizes the flip classroom teaching, and also allows the teachers to intervene directly in the student's whole study.

In the teaching process of SPOC, according to the syllabus of the course, the lecturer publishes the teaching video and arranges the homework. Students, according to the time of teaching arrangements, complete their own teaching video viewing, homework and online discussion. Offline, teachers carry on classroom teaching normally, and timely deal with the questions of online students. The teaching design of SPOC emphasizes the importance of classroom teaching, it is considered that classroom teaching is the key for teachers to control the rhythm of teaching and consolidate teaching results. The teaching methods of SPOC not only blends the advantages of the teaching mode of MOOC, but also makes up for the disadvantages of traditional teaching methods.

4. Design Scheme of Mixed Teaching Mode of SPOC
The Software engineering course, using the mixed teaching mode of SPOC, uses the form of the
Combination of line and offline. Before class, teachers in the special SPOC network platform provide relevant teaching resources, such as teaching video and PPT, and elicit relevant knowledge points in the form of projects. Students preview the course in advance according to the network teaching resources provided by the teacher, and understand the basic content of the project, task needs and course knowledge points, and complete the self-study before the class. In the course of classroom teaching, teachers can conduct course guidance and answer questions for different degrees of students, students can also take the initiative to complete classroom training according to their current mastery.

As an important supporting tool for new software engineering methodology, such as UML Class whose related teaching resource such as teaching video and teaching courseware can be used as learning resources for students to self-study. Through self-study of UML course, students can master the modeling language and tools in object-oriented software engineering methodology, so students understand the thought theory of object-oriented software engineering methodology, so as to complete the object-oriented software engineering modeling.

At the same time, teachers can participate in students' learning process through online and offline simultaneous discussion, and master students' learning situation, monitor students' learning process, and then change the learning status of students' passive acceptance, poor learning effect. The specific design of the hybrid teaching model based on SPOC is shown in the chart.

Table 1: Course Design of Software Engineering Based on SPOC Teaching Mode

| Teaching Hours | Present Teaching Content | Online Content | the Aim of Online Classes |
|----------------|--------------------------|----------------|--------------------------|
| 1              | Software Engineering Overview | the Acquisition of Software Demand | the Method and Theoretical System of Complete Demand Acquisition |
| 2-5            | Software Definition      | 1. UML Basic and Application 2. UI Design | Master a New Software Design Mode, Understand the Basic Methods of UIM Design |
| 5-10           | Software Design          | the Art of Source Code | Develop Procedural Thinking, Standardize Source Code |
| 11             | Software Code            | Full Software Technology Testing and Automation Testing | Improve the Technical Knowledge of Software Testing |
| 12-14          | Software Testing         | Management Knowledge System of PMP | Improve the Knowledge System and Work Content of Project Management |
| 15-16          | Operation and Maintenance|                            |                          |

According to the teaching design, the teachers use the SPOC teaching platform to publish the video learning materials of the relevant online courses, and prepare the related homework and test questions. Students watch instructional videos according to the teaching plan to complete online assignments and teacher issues. At the same time, the corresponding online tests can be arranged. Students can also communicate directly online with teachers and classmates on related issues. The teachers carry on the statistical analysis to the learning achievement of each lesson teaching.

Instructional videos can be derived from existing MOOC courses, other online courses or video sites, or they can be recorded by teachers themselves. But the time of the video course is required to do a certain amount of control, no more than 30 minutes is appropriate, as far as possible to do short and concise, focused.

In the offline classroom, the teachers analyse the key points and leave time for students to think and discuss according to the condition of the student's online homework, questions and the results of online testing. Teachers next to the guide, allow students to express their views, freely discuss and solve
problems. After class, students can still review the course content and organize their study notes through instructional videos. The teachers classify the students’ problems and analyze and evaluate the overall teaching results.

5. Conclusion
On the basis of SPOC’s theory, the mixed teaching mode of software engineering is designed, and the knowledge system of software engineering with complex content is divided into relatively independent and interrelated courses. The teaching content has been completely designed and the different emphases of line and offline are analyzed. So students master more knowledge of professional courses, and it enhances the students' learning ability through independent learning in the prescribed class time. At the same time, teachers are removed from repetitive teaching, with emphasis on enhancing the coaching and training of students' abilities, and improving the teaching quality and teaching efficiency of the courses.

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