The MOOC/SPOC Based “1+M+N” Multi-University Collaborative Teaching and Learning Mode: Practice and Experience

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本刊为
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中国重要会议论文全文数据库(CPCD)收录期刊
万方数据—数字化期刊群全文收录期刊
* * * * *
Research and Practice of Blending Teaching Based on “MOOC + SPOC + Flipped Classroom” for Software Engineering

Ce Zhang*, Dianhui Chu, Songlin Gu, Xiaofei Xu, Jianan Jiang, Zheng Wang, Hua Zhang

Abstract: Based on “MOOC + SPOC + Flipped Classroom”, a particular blending teaching pattern adapting to MOOC teaching is proposed to strengthen software engineering students’ abilities to study themselves and practice innovatively. Firstly, the process of MOOC development in China is introduced. The distinguishing feature and effect of MOOC teaching are analyzed, followed by the comparison with traditional class. The online Plus offline blending teaching pattern is the combination of online self-study on MOOC before class, seminar study of flipped classroom in class and the summary after class. With the demonstration of a typical case, a progressive strategy is given to implement blending teaching. Finally, the blending teaching pattern is assessed from multiple perspectives, of which both advantages and disadvantages are dissected. Through primary exploration, introducing online study and flipped classroom, blending teaching plays a positive role in software engineering teaching, which means traditional teaching pattern is changed. Meanwhile, students’ innovative consciousness and practical ability are inspired. Nevertheless, new problems arise, so that intensive practice and improvement are necessary.

Key words: software engineering; MOOC; SPOC; Flipped Classroom; online plus offline blending teaching

1 Introduction

With the deep development and wide spread of Internet, MOOC (Massive Open Online Courses) teaching[1-5], an online teaching pattern never seen before, is brought by the shock from “Internet +” and mobile Internet to higher education. Similar to the throughout change of trading ideas and situation in online shopping, the combination of MOOC teaching and traditional class is coercing the improvement of teaching quality reversely. A massive teaching reform is brewing[6-7], which will make MOOC a new trend in the development of college teaching.

As the combination of MOOC and the condition in China, SPOC (Small Private Online Course) is booming in Chinese computer education[8-11]. High-quality teaching resources are shared, followed by relief of inadequate teachers. Meanwhile, students’ abilities to self-study and practice is strengthened. Transformation of teaching pattern is greatly advanced and academic standard is raised.
The promotion of the abilities to self-study, practice and innovate is the emphasis in the process of software engineering development of talents. Practical engineering assets are developed to be innovative, international, industrial and urgently needed by the market\cite{4,12}. The teaching pattern based on “MOOC + SPOC + Flipped Classroom” is quite correspond to the aim of software engineering development of talents. Under the background of modern Internet and online education, it has become an important approach to develop internationally competitive top talents who can adapt to the technology advancement and change of social requirements. It is innovative and entrepreneurial awareness that they should have.

The development process, feature, function of MOOC teaching in China and the comparison with traditional teaching are briefly classified. According to the practice in MOOC teaching of software engineering in our college, the online plus offline blending teaching pattern, which is the combination of online self-study on MOOC before class, seminar study of flipped classroom in class and the summary after class, is proposed based on “MOOC + SPOC + Flipped Classroom” pattern. With the demonstration of a typical case, a specific strategy is given to implement blending teaching. MOOC teaching in software engineering is a new attempt. It is our sincere hope that our research will explore the online plus offline blending teaching pattern suited for software engineering and offer reference to develop software engineering talents better.

2 The Status of MOOC Development

1) The process of MOOC teaching development.

In 2012, online study platforms were gradually created by top USA universities, offering free courses. The growing of three providers, including Coursera, Udacity and edX, provided the possibility to study systematically for more students\cite{13-14}. In 2013, MOOC was unlocked in China\cite{15}, followed by the establishment of MOOC Alliance of Computer education in Colleges and Universities in China (CMOOC Alliance)\cite{16}. In 2016, Shandong committee of CMMOC Alliance was founded. When it comes to 2017, it’s a period of rapid development of MOOC teaching, including our university and college. This process can be seen in Fig. 1.

It has to be specifically mentioned that Shandong committee of CMMOC Alliance (Committee) was founded in Shandong Province. Harbin Institute of Technology (Weihai) is not only one of the first sponsor units and member units, but also director unit and secretary unit. Office of Committee is set up in our university as well.

College became one of the twelve pilot universities in China – MOOC teaching is used for part of software engineering courses. Reviewed by CMOOC, our college became one of the twelve pilot universities in China on behalf of our university. “MOOC + SPOC” teaching pattern has been carried out in a variety of courses. (It will be introduced in 4.2.)

2) Features of “MOOC + SPOC” teaching pattern.

Unprecedented changes has been brought with the coming of Internet age. Reforms are in progress all around the society, even education. Traditional teaching pattern and knowledge achievement are being changed essentially. Networking, interaction, individuation and more characters will be added to teaching and study.

The access to watch high-quality videos, do exercises, take tests and communicate is available with the coming of MOOC teaching age. Teaching and study will be more various and fantastic. Basic features of MOOC teaching are as follow.
• The limitation of traditional class is broken. Students can study whenever and wherever they like.
• The whole process of teaching and study are completed online.
• Teaching pattern is transformed from face – to – face teaching to a combination of short videos and activities.
• Teaching contents needs to be updated.
• Learners vary from good to bad. Study is more autonomous and individual.
• Experience and achievements are attached more attention in the process of study.
• Based on online plus offline blending teaching, flipped classroom is a chief development direction in computer education of colleges and universities.

Substantially, MOOC teaching is an intensive combination of education and information technology promoted by Internet technology. Teaching will be better served by online education.

3 Differences and Similarities Between MOOC Teaching and Traditional Class

Students have to login MOOC websites and watch several series of short videos which are called micro-class. Exercises, tests, homework, exams and discussion must be done online to finish the course. The leading teaching method is primarily face – to – face class. Brief differences can be seen in Table 1.

Similarities

Although there are differences between two teaching pattern in many aspects, deep-seated similarities exist as following three points.
• Two patterns share same aim at teaching quality and result. Just teaching pattern and method are changed.
• Teachers still teach, and students still study. Just teaching method and interaction are improved. The role that teacher plays is compared between MOOC teaching and traditional class in Table 2.
• Two patterns are both combination of teaching in class and study after class. Just the teaching profundity, the situation of class and studying method after class are innovated.

<table>
<thead>
<tr>
<th>Patterns aspect</th>
<th>Traditional class(offline)</th>
<th>MOOC teaching(online)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Resource</td>
<td>textbook + PPT + teaching note &lt;br&gt;(blackboard writing)</td>
<td>online videos + online discussion + textbook + PPT</td>
</tr>
<tr>
<td>Teaching Method</td>
<td>PPT + blackboard writing + programming &lt;br&gt;demo + classroom questioning</td>
<td>videos + online answering</td>
</tr>
<tr>
<td>Practicing way</td>
<td>experiment + assignment</td>
<td>online exercises + online tests (plenty of questions)</td>
</tr>
<tr>
<td>Assessing way</td>
<td>experiment + exam + assignment</td>
<td>online test + online assignment + online exam</td>
</tr>
<tr>
<td>Communicating way</td>
<td>communicate in the interval between classes</td>
<td>online discussion</td>
</tr>
</tbody>
</table>

Table 2 Comparison between MOOC teaching and traditional class.

<table>
<thead>
<tr>
<th>Teacher’s type</th>
<th>Teacher’s role</th>
<th>Effect in teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOOC keynote speaker</td>
<td>The keynote speakers in the online videos are usually who makes this MOOC course. They are also in charge of the general situation of this course</td>
<td>MOOC courses are used to study knowledge ahead as a guide</td>
</tr>
<tr>
<td>Teachers in traditional class</td>
<td>Teachers in traditional class are who give the lecture to students. They are in charge of the classes</td>
<td>Teachers teach and expand knowledge, analyze emphases, give tests and exercises and answer students’ questions through face – to – face class</td>
</tr>
<tr>
<td>MOOC answering teacher</td>
<td>Students ask questions in the process of online MOOC study, which should be answered by them. They may be the teachers from other universities</td>
<td>They answer students’ questions online</td>
</tr>
</tbody>
</table>

In summary, current traditional teaching and MOOC teaching each have their pros and cons. Accordingly, it is our first choice to implement SPOC, which is an interaction of OPO (Offline Plus Online).

Correctly understanding and dealing with the relation between online teaching and offline class is the key of online plus offline blending teaching pattern. Through making best use of the advantages of OPO, teaching becomes multi-dimensional, vivid and attractive. As a consequence, students’ interest is inspired and their abilities to self-study and explore are developed.
4 Online Plus Offline Blending Teaching Pattern – “MOOC + SPOC + Flipped Classroom”

The online plus offline blending teaching pattern based on “MOOC + SPOC + Flipped Classroom” is the direction of the reform of college education in the future. MOOC is an online teaching pattern that completes teaching contents within the syllabus, while SPOC emphasizes diverse teaching method for distinguishing people from different colleges[^8-9].

- Online (class on the website) – Students have to study MOOC courses themselves and finish all the videos, tests and discussion.
- Offline (face-to-face class) – Students have to listen to the lectures, take tests, make presentation and discuss. Based on lectures, contents of the course should be expanded. Flipped classroom is applied in offline class to strengthen students’ ability to study deeply themselves.

Figure 2 shows the online plus offline blending teaching pattern, including online study and offline study. Online study has to be finished after class by watching MOOC videos, do online exercises and tests and discussing online. Students need to finish the learning mission given by teachers ahead. In the offline study, students particulate the flipped classroom with the instruction from teachers. Then students have to present their achievements and discuss with each other. Finally, teacher will answer students’ questions.

Totally, online plus offline blending teaching pattern consists of three important parts – online self-study on MOOC before class, seminar study of flipped classroom in class and the summary after class.

Flipped classroom has diversified forms, basically including achievement presentation, discussion among students and assessment from teacher. These forms share one aim to strengthen students’ ability to self-study as well as to teach more emphases. Communication between teachers and students is increased. Study can be more flexible and active. Flipped classroom provides more participation to students, which makes students study more practically through exploring themselves.

Implement strategy – progressive development in various ways. In the development of blending teaching based on SPOC, the principle of “advancing gradually and iterate repeatedly” is put into use in software engineering teaching. Experience is accumulated by partly flipped teaching in order to realize. Specifically, blending teaching can be advanced gradually by following four progressive methods: Introduce SPOC (not flipped classroom) → Partly flip small classes → Totally flip small classes → Totally flip large classes. In present, the strategy is implemented in seven courses of software engineering, which is shown in Table 3.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Computer Science</td>
<td>Partly flip large classes</td>
</tr>
<tr>
<td>College Computer</td>
<td>Partly flip large classes</td>
</tr>
<tr>
<td>C Programming and Designing</td>
<td>Totally flip large classes</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>Introduce SPOC (no flipped classroom)</td>
</tr>
<tr>
<td>Data Structure</td>
<td>Partly flip large classes</td>
</tr>
<tr>
<td>Principles of Computer Organization</td>
<td>Introduce SPOC (no flipped classroom)</td>
</tr>
<tr>
<td>Game Engine Designing and Practicing</td>
<td>Totally flip small classes</td>
</tr>
</tbody>
</table>

Based on the elicitation teaching reform, large classes are totally flipped in C Programming and
Designing (Fig. 3). Students study themselves online beyond the class. Flipped teaching is implemented by tests, assignment, discussion and presentation in class. After that, students have to sum up what they study.

Achievability, ability to self-study and some aspects are promoted, while study burden and difficulty are growing. Even conflicting emotions occur to some students. As a result, intensive researches should be done.

It is still in experimental stage that the teaching pattern based on “MOOC + SPOC + Flipped Classroom” is in China. A long period is needed to figure out how to implement better. We are bold in practice in software engineering to accumulate experience which is not enough. We will certainly persist in exploring an appropriate and actual teaching pattern, contributing new references for software engineering talents development.

5 Advantages and Disadvantages in Primary Assessment

In latest terms, blending teaching has been implemented variously. Students are provided more participation and offered more thorny points, important points and frontier knowledge by teachers. The reform of teaching pattern is advanced, causing considerable attention to online education. According to the communication between teachers and students, the situation of blending teaching is qualitatively assessed in Table 4.

It can be seen that individual satisfaction, individual

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Result</th>
<th>Aspect</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>individual satisfaction</td>
<td>raise</td>
<td>individual</td>
<td>raise</td>
</tr>
<tr>
<td>achieveability</td>
<td>raise</td>
<td>difficulty to self-study</td>
<td>more</td>
</tr>
<tr>
<td>confidence</td>
<td>raise</td>
<td>study burden</td>
<td>more</td>
</tr>
<tr>
<td>ability to self-study</td>
<td>raise</td>
<td>adaptability</td>
<td>difficult to easy</td>
</tr>
<tr>
<td>entertainment</td>
<td>raise</td>
<td>conflicting emotion</td>
<td>conflict to accept gradually</td>
</tr>
<tr>
<td>communication and interaction</td>
<td>raise</td>
<td>study effect</td>
<td>totally up</td>
</tr>
<tr>
<td>ability to practice</td>
<td>raise</td>
<td>Innovative awareness</td>
<td>raise</td>
</tr>
</tbody>
</table>
“MOOC + SPOC + Flipped Classroom”, is too short, so that intensive practice and summary are necessary. Meanwhile, existing problems have to be solved gradually associated to the feature of the major. Various teaching perceptions, including researching, eliciting, exploring, discussing and participating teaching, should be combined into traditional class. Students’ self-study and instructions from teachers can be better connected, followed by optimal overall teaching effect.

Acknowledgement

The paper is supported by 2016 Shandong province undergraduate universities teaching reform research project: Exploration and practice of teaching reform and innovation mode of higher education based on MOOC (No.B2016Z018), Research and application of blended teaching mode based on MOOC+SPOCs+ flipped classroom(No.B2016Z020), teaching research project of 2016 Postgraduate Education Innovation Project in Shandong Province: Study on multi-dimensional education quality evaluation system for professional degree graduate students (SDYZ1603), research project of higher computer education: "Study of Staged Practice Education and Innovation Ability Development"(ER2016009), the Chinese National Supervisory Committee for the Education of Master of Engineering under Grant(No. 2016-ZDn-6), Shandong Provincial Department of Education under Grant(No. SDYY14003) and teaching research project of Harbin Institute of Technology at Weihai (BK201602) as well.

References


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(Publishing Editor: Zhiwei Shi)