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

NavApp: A Mobile App as a Master's Thesis

**Studies and Practices on Cloud-Based Practical
Teaching Unified Services System and Teaching Mode**

**Undergraduate Engineering Projects:
Improvement through the Use of VLEs**

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

Xiaofei Xu, Dechen Zhan, Ce Zhang, Dianhui Chu, Weihua Guo

Abstract: Since 2012, the MOOCs, the massive open online courses, have brought big influences on the higher education in the world. How to use MOOCs to help universities rather than bother them to improve their education level and quality becomes an important issue. In China, many universities have explored the new modes and approaches for MOOC/SPOC-based teaching and learning. Especially, the China MOOC Association on Computing Education (CMOOC association), established in 2014, has done a set of successful practice and achieved fruitful experiences on MOOC courses development and computer education reform. Based on the practical experiences, a MOOC/SPOC based “1+M+N” multi-university collaborative teaching and learning mode is presented, which is adapted to the real situation of Chinese university education. In the paper, the practices and experiences of CMOOC association are introduced, the MOOC/SPOC based “1+M+N” multi-university collaborative teaching and learning mode and its approaches are described. Finally, the suggestions for MOOCs development and applications are also presented.

Key words: MOOCs; SPOCs; CMOOC Association; “1+M+N” collaborative teaching and learning model; flipped classroom based teaching approaches

1 Introduction

Since 2012, the Massive Open Online Courses (MOOCs) have developed worldwide. It brings the huge influences and challenges to global higher

education, which is manifested in education resource, learning approaches and educational competition^[1-3], etc. MOOCs have the characteristics of massive, high level, online, open, free, bringing about the teaching and learning approaches reform – flipped classroom, active learning, interactive learning, O2O learning, causing educational competition globally.

Following the development procedure of the MOOCs, the year 2012 can be defined as the beginning year of the MOOCs. The year 2013 can be regarded as the first year of the MOOCs in China. While in 2014, the China Association of MOOCs on Computing Education (CMOOC Association) was established.

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Since 2014, the MOOC education in China has developed very fast, and entered a new stage in 2018.

Chinese government strongly supports to develop the MOOC resource and introduce MOOC/SPOC into the university education systems. In 2018, the Ministry of Education (MoE) of China has announced the 490 National Excellent Open Online Courses, which is the strategic action to promote open online education in China.

In China, many universities have explored the new modes and approaches for MOOC/SPOC-based teaching and learning. The MOOC/SPOC based “1+M+N” collaborative teaching mode is one of the approaches to apply MOOCs to adapt to Chinese university education and students’ demands.

2 State of Art for Development of MOOCs in the World and in China

2.1 Growth of MOOCs in the world

In recent years, the MOOCs have grown up very fast. In 2016, more than 6850 MOOC Courses were delivered by over 700 universities in the world, in which 2600 MOOCs were newly increased. The number of the registered students was 58 million. While in 2017, more than 8500 MOOC Courses were delivered in the world.

2.2 State of art for development of MOOCs in China

Until 2018, more than 5,000 Chinese MOOC courses have been developed by more than 500 universities, which are delivered onto more than 10 Chinese MOOC platforms. The number of the MOOC courses of China ranks #1 in the world. In the meantime, more than 200 Chinese MOOC courses have been delivered onto the international MOOC platforms. More than 70 million students have registered for learning MOOC courses in the MOOC platforms, and 11 million students have received the credits of MOOC courses.

In the same period, more than 500 Chinese MOOC courses on computing have been delivered. More than 15 million students have registered in these courses. 43

MOOC courses on computing have been identified as National Excellent Online Courses by MoE.

3 Practice and Experience of CMOOC – China Association of MOOCs on Computing Education

3.1 CMOOC – a largest China Association of MOOCs on computer education

On December 2014, the CMOOC Association was founded in Beijing. The number of CMOOC membership increased from 100 in 2014 to 600 in 2018. The members are mainly Chinese universities which would like to develop or apply MOOC on computer science and software engineering.

The main objective is to promote development of MOOC for computer education, and enhance the influences of Chinese universities in the domain of computer science and software engineering, in order to improve education quality on computing and realize the equitable education in China.

The CMOOC Association has established a systematic organization: Chairman and vice chairman, board/steering committee, and secretary office. There are many working committees, local sub-working committees, course working groups and MOOC training centers. CMOOC Association has also established 23 Provincial/Cities Sub-Working Committees for promoting MOOC teaching/learning in each province and city.

There are five CMOOC working committees on course development, quality and standardization, MOOC teacher training, university-industry cooperation, and international collaboration, respectively. The Working Committee on Course Development is responsible for MOOC course development and identification. It owns 15 working groups on MOOC/SPOC courses development and teaching. The Working Committee on Quality and Standardization is responsible for making standards, specification, guidelines for MOOC course development and evaluation, teaching approaches,

application cases, accreditation. The Working Committee on MOOC Teacher Training is responsible for MOOCs applications and teacher training. It manages 8 MOOC training centers in Beijing, Shanghai, Hangzhou, Shenzhen, Xi' an, Chengdu, Dalian, and Weihai. The Working Committee on University-Industry Cooperation is responsible for developing industry-linked MOOC courses and related business. And the Working Committee on International Collaboration is responsible for developing cooperation with other international MOOC organizations.

3.2 CMOOC – tasks and activities

The main tasks and activities of CMOOC include the following:

- (1) Establishing organization, opening the portal of CMOOC;
- (2) Integrating MOOC resource, developing MOOC courses;
- (3) Developing CMOOC operation rules, defining certification standards;
- (4) Training MOOC teachers and TAs, performing MOOC teaching practice;
- (5) Researching and transferring MOOC teaching approaches;
- (6) Promoting university-industry cooperation, international collaboration;
- (7) Holding MOOC workshops/conferences.

From 2015 to 2017, total 54 MOOC courses on computing have been selected as the CMOOC developing MOOC courses. And 25 MOOC courses on computing have been evaluated as the CMOOC excellent MOOC courses. In 2018, 37 CMOOC courses have been identified as National Excellent Online Courses by MoE. More than six million students of 600 universities in China have benefited from MOOC/SPOC teaching and learning.

In order to promote development of MOOC courses, CMOOC has organized many conferences and training classes on MOOC courses. Moreover, 30

online teaching/learning tools are selected for online experiment, practice, testing and examination.

After more than 4 years' development, CMOOC has achieved remarkable results in promoting computer teaching reform based on MOOC.

4 MOOC/SPOC based “1+M+N” Multi-University Collaborative Teaching and Learning Mode

4.1 The MOOC/SPOC based “1+M+N” teaching and learning mode

As a kind of open online courses, MOOCs are opened to and connected with the public learners in many countries. The traditional MOOC transferring and application mode can be summarized as “1+N” mode, which means that 1 MOOC course on the MOOC platform is learned by N students.

But in China, it is more concerned about how to use MOOCs to improve the quality of education and teaching of many universities, so as to teaching massive students. Therefore, we propose a MOOC/SPOC-based Multi-University Collaborative Teaching/Learning Mode: 1+M+N, as shown in Fig. 1.

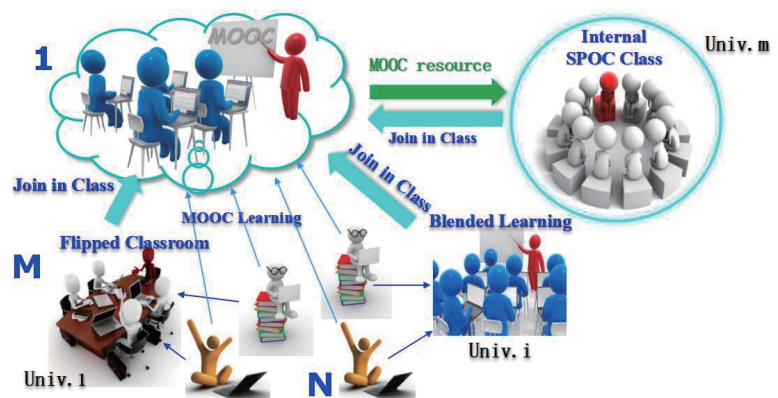


Fig. 1 The MOOC/SPOC based “1+M+N” collaborative teaching/learning mode.

In the MOOC/SPOC based “1+M+N” Collaborative Teaching/Learning Mode, the “1” means 1 MOOC course, “M” represents M universities with SPOCs, and “N” corresponds to N students. This mode emphasizes to build the “1” good MOOC course by the teachers and a MOOC center, collaborate with the

“M” universities to develop the SPOCs, and teach “N” students in the universities as well.

In order to apply the MOOC/SPOC based “1+M+N” Collaborative Teaching/Learning Mode, it is necessary to do the following jobs well.

(1) “1” : To build the advanced MOOC course or educational resource by the high quality teachers or experts, by means of MOOC courses platforms;

(2) “M” : To do the MOOC/SPOC based blended collaborative teaching/learning through crossing over domain and multi-universities;

(3) “N” : To attract and even organize the N massive students among multi-universities to learn the course actively and interactively online/offline.

The joint teaching teams of cross-universities are very helpful to do on-line/off-line collaborative teaching and learning. One teacher collaborates with multi-universities, M universities form multi-groups of N students, N students learn online-offline by self-learning & group learning anywhere on campus, and interact among multi-groups.

4.2 MOOC+SPOC: blended teaching approach

As shown in Fig. 2, in blended teaching approach based on “MOOCs + SPOCs + Flipped Classrooms”^[4-5], the MOOC courses provide and define standard contents, and different universities create SPOCs derived from MOOC courses. The teachers organize students to carry out online teaching based on MOOCs + SPOCs while implementing flipped classroom teaching in offline classrooms.

The online/offline blended teaching approach is a new teaching mode, with the advantages of integrating the advanced educational resource.

4.3 Development of the MOOC course groups

Depending on different types of courses, the course groups can be developed as the following approaches.

(1) MOOC/SPOC based “1+M” Course Group Type: Implementing MOOC based blended teaching can be grouped as “1+M” MOOC/SPOC Type, in which one MOOC course and multi-universities SPOCs can be performed by means of MOOC/SPOC based flipped classroom” .

(2) Knowledge Unit Module based Course Group Type: Based on the units of body of knowledge, the specialty areas related MOOC course groups or modules can be developed together, e.g. the course groups on programming languages, fundamental computing, computer system techniques, system software, software engineering, computer network, artificial intelligence, information systems, information security, etc.

(3) Multi-Teaching Approach based Course Group Type: Based on different teaching approach or functions, the MOOC course groups can be built in deferent groups, e.g. the course groups on fundamental courses, system ability courses, experimental courses, innovation courses, industrial sector courses, etc.

(4) Application Domain based Course Group Type: For applied universities, various IT application course groups can be built in deferent groups, e.g. the course groups on internet applications, IoT, e-business, e-healthcare, computer aided design, digital media, IT application sectors, etc.

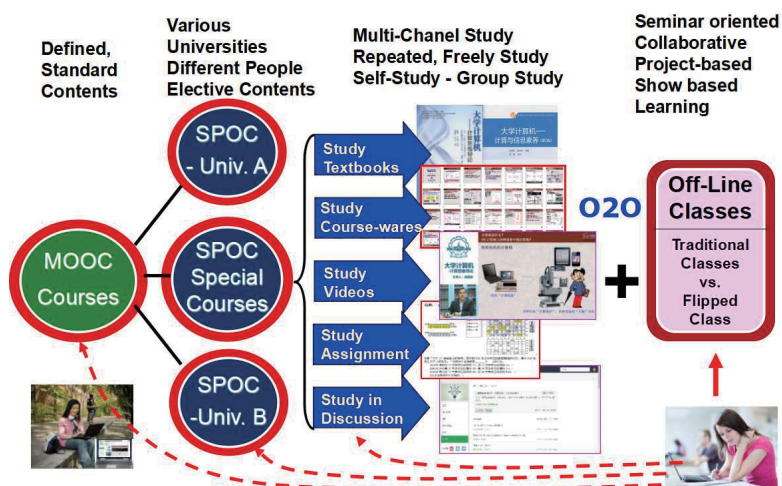


Fig. 2 Blended teaching approach based on MOOC + SPOC.

5 Applying MOOCs for Improving Education on Computer Science and Software Engineering

5.1 The key issues for universities to apply MOOCs

The MOOCs for Education of Computer Science (CS) & Software Engineering (SE) are very helpful for improving teaching and learning quality in universities. In practice, the following issues are very important factors for the universities to apply MOOCs.

- (1) Changing the educational concepts;
- (2) Supporting improvement of educational level and quality;
- (3) Improving teaching & learning approaches;
- (4) Encouraging active learning and engagement of students;
- (5) Providing more choices for students to learn CS & SE;
- (6) Decreasing the gap between different levels of universities;
- (7) Sharing advanced education resources;
- (8) Promoting internationalization of education on CS & SE.

5.2 Applying MOOCs for improving education on CS & SE

The following issues are very important factors for applying MOOCs for improving CS & SE education.

- (1) Developing MOOC resource & systems on CS & SE.

The foundation of MOOC based teaching is to establish a rich resource system, including curricula, courses, platforms and services. It is important to develop MOOC curricula for CS & SE based on body of knowledge, the shareable MOOC courses, the MOOC resource platforms, and the MOOC educational service systems and quality assurance standards on CS & SE.

- (2) Application of MOOC for CS & SE education.

The teachers should play the master roles of MOOC/SPOC based approaches in teaching and examination,

flipped/blend teaching methods, gather referenced MOOC courses on CS & SE, and instruct students to carry out MOOC learning approaches involving MOOC/SPOC based approaches of learning, active learning, O2O learning. The MOOC oriented education management is developed to guarantee the standard and order, e.g. MOOC learning procedure management and MOOC quality assurance standards. The MOOC communities of teachers, students and the related stakeholders are very helpful for collaborative teaching and active learning.

- (3) Association of the MOOC related universities/institutes.

MOOC course association is an effective organization for MOOC development and application in wide scopes. The CMOOC Association, a university association of MOOC courses on CS & SE, plays an active role to build and share the MOOC course resource, apply MOOCs in many universities, and define the common credit system and quality assurance standards. The MOOC certification mechanism is critical for the MOOC association, including the certification of association members, MOOC courses, teachers, student credits and scores, education quality assurance standards, teaching workload calculation, etc.

In addition, it is necessary to develop industry oriented MOOC courses, build new type of cooperation based on MOOC training and approval through cooperation between universities and enterprises.

6 Conclusion

The MOOC wave brings a big challenge and influence to universities in the world. The universities should be adaptive to MOOC wave, rather than avoid and oppose it. The universities should collaborate to develop a set of high quality MOOC courses, especially for emerging engineering. Every university may develop its own SPOCs to meet its own demands. It is very important to apply MOOCs for education reform and for new teaching/learning approaches. The MOOC/

SPOC based multi-universities 1+M+N collaborative teaching/learning mode is very meaningful for Chinese universities. The quality standards are necessary for the MOOC education systems to disseminate MOOC based teaching/learning. To get benefit from education reform, it is necessary to improve the MOOC related education approaches by means of flipped classroom, blended teaching/learning methods, big data analytics, etc.

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