

# International Journal for Innovation Education and Research

ONLINE ISSN: 2411-2933 PRINT - ISSN: 2411-3123

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**Published Date:** 11/30/2017

**Page.17-27**

**Vol 5 No 11 2017**

**Link:** <http://ijer.net/ijer/article/view/801>

# New Online Teaching Mode of Higher Education with Information Technology

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## Abstract

*In this article, the current situation of online teaching of higher education in the information age was briefly described, and the characteristics of MOOC and SPOC was also analyzed and compared to propose and construct a new mode of post-MOOC online education based on "autonomous learning - collaborative learning – mixed learning and learning "SCH-SPOC teaching model; and taking the teaching of engineering graphics course exploration as an example, demonstrated the resource-sharing individualized learning mode, while co-teaching collaborative learning mode and flip classroom mixed learning The significance of the new model is to gradually break the traditional pattern of "full house".*

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## 1. Introduction

With the rapid development of information technology, multimedia and network on behalf of the information technology produce a revolutionary impact on higher education. Under the influence of education philosophy such as free, shared and open, massive open online courses (MOOCs) have rapidly risen all over the world [1, 2]. Though MOOCs have the obvious advantages of easiness to use, covering a wide population, and rich learning-resource, many shortcomings are gradually exposed that are the high rate of drop out of school, unideal teaching effect, and the weak interaction between teachers and learners. Therefore, after the MOOC period, the emergence of new online learning models, such as small-scale private online courses SPOC (SPOC) for specific populations, limited enrollment and enrollment conditions seems to be the trend of globalization [3].

Nowadays, digital, networked, intelligent learning is increasingly popular, but the learning effect has not substantial improvement, so that learning process often stays initial level. This learning is so called a hotbed of breed this kind of learning. Zhang Qi and other Chinese scholars considered that there is still a large gap between e-Learning for promoting personalized learning and advanced learning goals [4]. Learning resources and learning activities online did not have a significant innovation, and learning enthusiasm and self-control are at a low level. The digital learning accompanied by the phenomenon of fragmentation, multi-tasking and shallow reading can bring diversity and convenience, but more prone to result in the deficiencies of low deep learning. Also, as a single online education, MOOC has the same issue. Though quality educational resources and learning process of MOOC bring a new learning experience for learners,

MOOC can't meet the individual learning needs of learners because of the monotonous presentation mode, deficiencies of targeted guidance, online participation. As a result, it is difficult to be in deep learning [2].

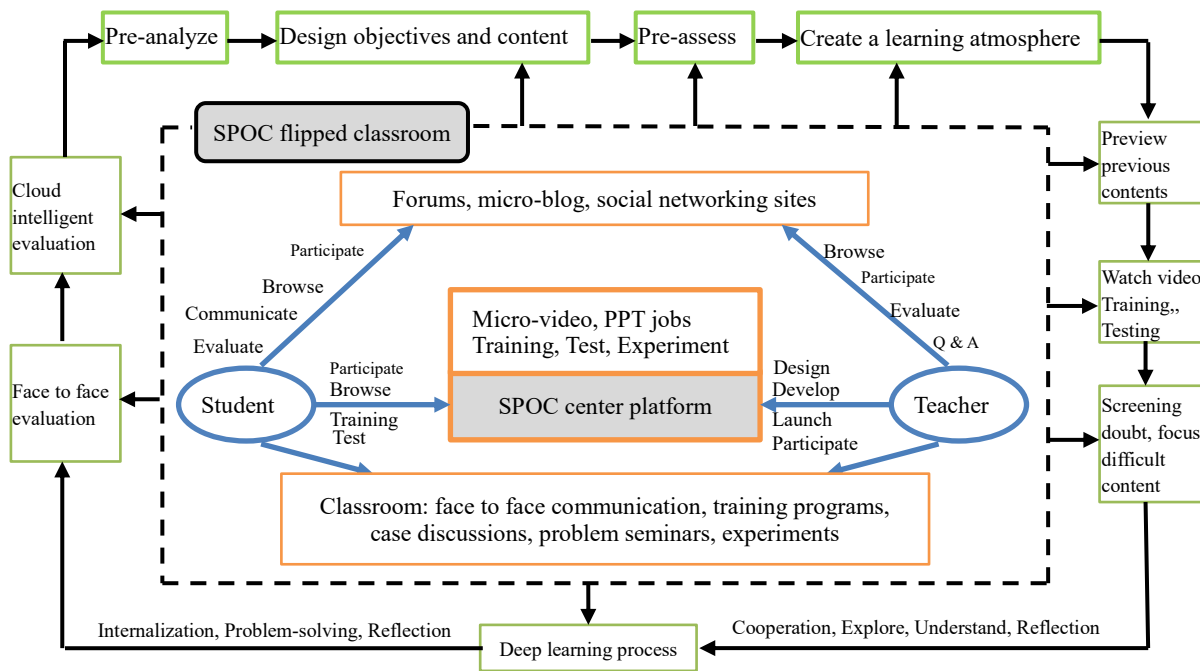
Only information receipt for most MOOC courses has been completed. However, the application of information technology in practical teaching has gradually migrated from marginalization to the core in MOOC teaching, which looks going towards the deep learning as goals and aspirations of information technology teaching. After MOOC, a blended learning mode--SPOC combined by its online education and teaching entities may become a more popular mode of teaching. In this context, the main purpose of this paper is how to use SPOC resources to build deep learning mode, in an effort to enhance the teaching quality of universities.

## **2. The deep learning mode based on SPOC**

Lorin W. Anderson elaborated hierarchical division theory on cognitive dimension, which advocates learning hierarchical division into deep learning and surface learning. Thereafter, Ference Marton and Roger Saljo applied this theory to experimentally perform a series of study on reading among students, and published an article entitled "On qualitative differences in learning: I-Outcome and process," in 1976, which creatively presented and explained the two concepts, deep Learning and surface learning [5].

From different perspectives, Biggs, Ramsden, Entwistle and other scholars have explored the deep learning, and thought it reflects that students committed to applying diverse learning strategies such as extensive reading, interaction, resource integration, systematical thinking, situational learning to achieve deep understanding of knowledge. Eric Jensen and LeAnn Nickelsen think deep learning refers to that the acquisition of new knowledge or mastering skills must undergo a multi-step learning process and high-level analysis and processing to apply these knowledge and skills by changing the ideas, behavior or self-control.

Chinese famous scholar Li Jiahou has said "deep learning is that on the basis of understanding, learners can critically learn new ideas and facts, and integrate them into the existing cognitive structure. And learners are able to connect many ideas and migrate existing knowledge into the new situation to make a decision and solve some problems. The deep learning based on SPOC shown in **Figure 1** is composed of the flipped classroom, DELC deep learning process, and support of SPOC for deep learning.



**Figure 1** Deep learning model based on SPOC

SPOC is the inheritance and development of MOOC. Its central platform and running processes similar to MOOC platform are the combination of classroom and network classroom, and divided into online teaching before class and classroom teaching offline.

## 2.1 Online teaching before class

a. Design and develop teaching resources by teachers

In advance, Teachers design, develop, and prepare SPOC teaching resources including main teaching content based on micro-video, complemented by micro-case, micro-projects, experiments and other micro-creative training resources, as well as learning feedback including micro-operations as main activities, complemented by online learning, online testing, online statistics and other independent learning activities. Teachers upload teaching resources to SPOC center platform, and arrange students self-learning before class.

b. Watch micro-videos and learn new knowledge

Students are required to register and login SPOC center platform, then select course, browse and learn resources at the right time, the right way to watch SPOC micro-video.

### c. Training and test

After watching micro-video, students should finish a brief training and test. Test results will be automatically real-time feedback.

#### d. Communicate between teachers and students and evaluation

After training or testing, the problems that the students failed to understand can be launched in the SPOC forums, micro-blog, social networking to discuss with the teacher or other students, wherein the problems failed to be solved or new issues, students can bring them to the classroom to face to face discuss with teachers.

## 2.2 The classroom teaching model offline

The classroom teaching model offline is shown in Figure 2. Students mainly participate in classroom activities such as situation simulations, role-playing, programs training, case discussions, communication and debate, problems discussion, scientific experiments, which are divided into three interrelated stages: classroom guiding, classroom discussions, and classroom evaluation.

### a. Classroom guiding

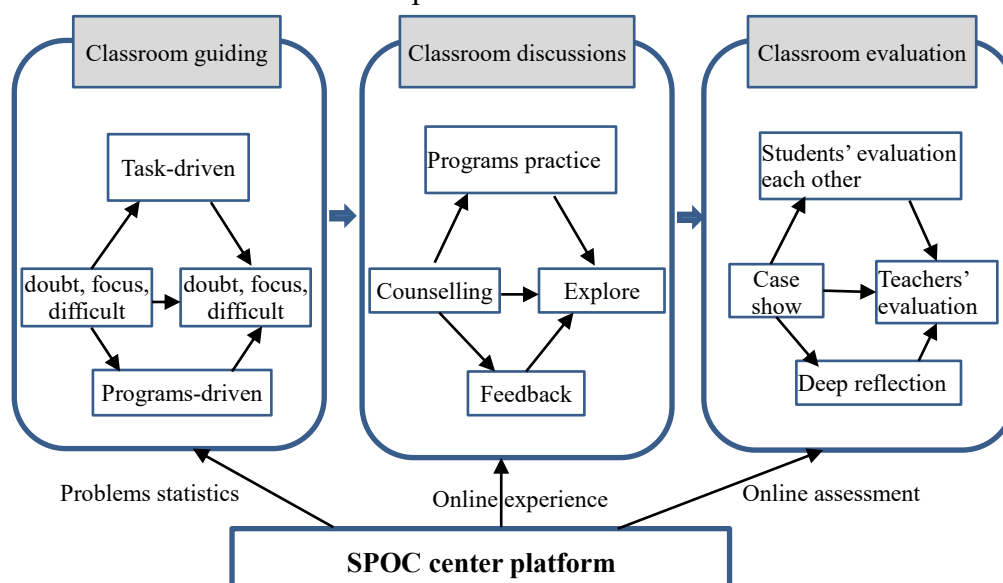
First, teachers can quickly know students' overall learning situation before class through learning process recording and statistical analysis from SPOC platform. As well, teachers can classify and organize problems in order to facilitate to solve them. Then training programs, case and tasks are arranged to students for the creation of the training environment and statement of guidance.

### b. Classroom discussion.

Analog to work teams in business, student are grouped ( $n = 3-5$ ) for project training, cooperative exploration and discussion. During, student can independently think, mutual exchange, and discuss together to solve the problems encountered in the training process. Also, communication with the teacher is favor of solving problems. For universal problems, teachers can unified demonstrate in the group or in class. Moreover teachers should guide students to think deeper problem in the process.

### c. Classroom assessment

Students show their own works by group, or illustrate their research results. After that the self-assessment, peer assessment and teacher evaluation are performed.



**Figure 2** Teaching model for SPOC flipped classroom offline

### **3. Necessary support of information technology**

Deep learning needs to support of information technology. They need the support of computer hardware and software that instructional videos are produced by teachers, and watch them by students at home, construction of personalized and collaborative learning environments.

Slow network speed is one of the negative factors restricting many schools teaching today. To implement online teaching, school should solve this problem through various ways such as the configuration of high-performance server, increasing the access amount of network broadband, because students are required to learn after class through the computer and the network. For some students who are lack of hardware conditions, the school should provide the appropriate the support, such as computer rooms should be open to students in their spare time.

The quality of teaching video has an important influence on students' learning after school. From shooting video to video clips, professional technical supports are required to design various styles for different subject. Schools need to provide technical support to the instructor, especially process-oriented publishing, which is an important factor of success for Massachusetts Institute of Technology. In addition, SPOC online teaching depends on the exchange between teachers and students, students and students. Use of information technology and personalized collaborative learning environment are essential for students, which involves teaching support platform. Of course, teachers can choose different teaching platform according to their own courses design.

#### **3.1 Active learning anywhere and anytime**

Due to online and network education, more and more high-quality courses from first-class university are free online, so the students can conveniently acquire knowledge, no longer confined in the classroom.

All educational activities must be to mobilize the students' initiative, enthusiasm as the starting point. Different from pure online teaching mode, SCH-SPOC (Self-directed learning, Collaborative learning and Hybrid learning Small Private Online Course) teaching mode online is more inclined to expand knowledge, present forward-looking content, focusing on the development of students' thinking, ability to analyze and solve problems. This may change the student' passive state in instilling-type classroom to cultivate students individualized independence in the acquisition of knowledge, and to further expand thinking [6].

SCH-SPOC teaching model is mainly targeted at college students, through the online online teaching and offline classroom teaching, that is, students look outside the classroom at the same time outside the classroom teaching video, teachers use the classroom teaching time At the same time, it is necessary to flexibly set and dynamically adjust curriculum difficulty, progress and grading standards according to the needs of students in order to clarify and resolve doubts, sort out and discuss the key and difficult issues, and strengthen the practice and consolidation of knowledge. Although SCH-SPOC draws on SPOC's

teaching philosophy, it has a broader connotation than SPOC. It contains three learning modes: autonomous learning, collaborative learning and blended learning.

### **3.2 Teaching resources, information-sharing, autonomous learning anytime, anywhere**

#### **3.2.1 Custom high-quality teaching resources open to share**

The online and online education has enabled more and more top-quality courses from leading universities to be freely available online, so that students' access to knowledge will no longer be restricted to the classroom. The key to the quality of open teaching resources lies in whether the sharing of resources meets the needs of users. In order to reflect the commonality of resource sharing and to adapt to the individuality of different school curriculum requirements, a learning platform model of "engineering Drawing" MOOC platform and synchronous "engineering Drawing" SPOC curriculum coexist is adopted.

MOOC platform for all participating students can share resources, including the teacher's teaching courseware, teaching videos, ponder questions and the next pre-notice and other public information, students can also discuss the panel to the main teacher, and other college students Discuss discussion. In view of the teaching requirements of different schools, the progress of teaching and the basis of students, there are differences in the MOOC platform to build a synchronous SPOC course group consisting of SPOC courses of each school. Therefore, the "Engineering Drawing" SPOC courses in each school are relatively independent, Also simultaneously share the same time teaching resources in different places.

#### **3.2.2 Personalized learning conditions**

All activities of education must take the initiative to mobilize students, motivation as a starting point. Unlike pure online teaching, online lectures in the SCH-SPOC teaching model tend to be more informative, forward-looking and content oriented depth introduction.

Therefore, this focus on the development of students' thinking, emphasizing students' ability to analyze and solve problems, changing students' passive learning status in indoctrination classrooms, and providing students with knowledge acquisition, developing thinking and training ability [7]. With the help of synchronized SPOC courses at various schools, learning activities such as online pondering, discussion questions, self-test questions, homework assessment, make students actively participate in learning to master the initiative of learning, and then develop their self-learning awareness and ability, but also for teacher assessment and feedback on student learning to provide the foundation. Line, to carry out group discussions, so that students are free to "suspense" from being "taught" to take the initiative "class" at the same time, with the help of the arrangement of extra-curricular self-test volume, so that students stand on the teacher's point of view, self-design, self-test, give full play to students' subjective initiative. For different students in different schools, offline teachers use different ways of using online resources according to their own teaching requirements. For example, some students in schools follow through on their own courses and some schools participate in online activities on a voluntary basis by students. This online and offline



organic combination of learning methods, fully embodies the students to decide on their own learning time, place, decide learning speed (number of views, playing speed), independent decision learning path personalized, autonomous learning characteristics.

### **3.3 The remote cooperative teaching in the support of teaching environment information**

Under the support of informative teaching environment, the teaching environment based on multimedia and internet has changed the organization and presentation of teaching information. In 2014, at the same time, in the same time, the synergistic lectures of teachers and teachers gave full play to the synergetic effect of the teachers' community. The 21 senior teachers from 20 universities in China were invited to cooperate in the online teaching and teaching of their respective chiefs with complementary advantages and pay attention to The expansion and extension of knowledge, the introduction of disciplinary frontiers and the training of ways of thinking, collaborative innovation. As the speaker made careful preparation of the content, teaching a wide range of knowledge, large amount of information, broaden the horizons of students, thus contributing to the students' autonomous learning and thinking.

The informative teaching environment not only laid a good foundation for the discussion, mutual aid and mutual promotion among learners, but also improved the learning efficiency. It also provided favorable conditions for the communication between the learners and learners, teachers and teachers.

#### **3.3.1 Student and student collaboration**

SCH-SPOC teaching mode is the combination of online and offline. Online is cross-campus, cross-school simultaneous teaching at different places, this joint teaching of online teaching can not only let students through the network to understand the learning atmosphere of other colleges and universities, campus students to motivate students to learn motivation, but also through online operations Evaluation, or even organize competitions to learn each other. Flip the classroom offline, organize collaborative group study, organize students to discuss, exchange views, put forward questions in the discussion, draw the correct conclusions in mutual doubts and arguments, so as to promote each other and improve together in the atmosphere of learning from each other.

#### **3.3.2 Teachers and students collaboration.**

The open online teaching platform also provides a good communication channel between students and teachers. Online, teachers can directly encourage students to ask questions and make comments during different lectures at the same time. They can also answer students' questions through the Internet and engage in interactive activities such as online thematic discussion and homework feedback. Line, classroom teaching from the transmission and delivery of knowledge for the purpose of information display and delivery, into interpretation, guidance and discussion-based teaching, teachers can directly participate in the discussion of the performance of the participants, the overall evaluation of the group well aware So that teachers can obtain teaching feedback more effectively and objectively. At the same time, some generative knowledge generated during the discussion also provides first-hand information for teachers' teaching and



learning improvement, so that teaching and learning can provide continuous improvement in teaching quality.

### 3.3.3 Teacher collaboration.

In inter-campus, cross-school at the same time different places in the process of lectures, the teacher is bound to make their own efforts, with several times the time in preparation for the traditional classroom teaching hours of preparation, virtually unknowingly reconstruct their knowledge system and construction, and It is a good opportunity for non-teacher teachers participating in simultaneous teaching activities, especially for young teachers who have less teaching experience. In the lesson preparation, lectures and observation, summarizes the discussion, teachers learn from each other inspiration, in order to achieve the optimization of teaching resources, as well as the coordinated development of teachers.

In summary, online learning in the SCH-SPOC teaching model is not an isolated memory and practice for learners, but a synergistic learning and development among students and students, students and teachers, as well as teachers and teachers. This inter-school collaboration, Collaboration, teacher collaboration, teacher-student collaboration and life-and-life collaboration are all-dimensional and multi-level collaboration. At this time, the effect produced by the collaborative community is much larger than that of individual effects. Teachers and students are both the beneficiaries of the curriculum and the producers of the curriculum Greatly enhance the overall effect of collaborative teaching [8].

### 3.4 Online and offline mixed learning supported by teaching information

In the coming years, paradigms and contexts of education are shifting to include more online learning, blended learning and collaborative learning. The so-called hybrid learning refers to the traditional teaching and digital teaching advantages of organic combination, so as to obtain a better teaching effect of the learning model.

In the teaching space and time, we can use online teaching or video mixing with the line below. For teaching resources, we have not only online video resources such as text and text resources, but also physical and experimental classroom resources. For learning subject, they are from the same class, the same school learners, and cross-campus, cross-school learners. Therefore, based on online simultaneous teaching, on the one hand, students from different colleges and universities simultaneously watch the contents of lectures at the same time in different places through the network. On the other hand, students can sow teaching resources anytime, anywhere through the network, and teachers can pass Arrange online practice, interspersed with small test, homework assessment, forum voting, etc., to encourage learners to learn from each other online. At the same time, in different places, teachers focus their efforts not to make exhaustive arrangements, leaving space for students to explore, to reduce the mechanical components in teaching, to enhance their guiding elements and to enhance students' motivation in learning.

With the deepening of online learning, the traditional teaching mode of face-to-face teaching is gradually

replaced by the teaching organization form of "Flipped classroom". In overturning classroom teaching, teachers review and sort out the knowledge points. Students are then divided into groups to discuss and solve problems [9]. Teachers help students to internalize their knowledge and test students in a timely manner. For teachers, flipped classroom is the change from the teacher's "teaching" to the students "learning", from the "knowledge of the impartial" to "the development of students" [10]. For students, Flip Class changes the way students learn, enabling students to learn (prep) online knowledge and actively explore and construct knowledge in class activities so that students enjoy learning in the classroom. To the success of learning, to further promote the independent development of students.

In order to compare the learning effects of SCH-SPOC education mode, pre-test and post-test questionnaire survey were conducted on students who participated in the study. 85% of the students said they were "satisfied" and "basically satisfied" with the teaching of the course, and most of the students "increased their interest in learning," "promoted the design of the learning activities to achieve the prescribed curriculum goals and abilities," "My Autonomous Learning" expressed their approval and affirmation [11, 12]. In investigating the influence of curriculum learning on students' skills and abilities, the factors of "information literacy" and "creating innovative skills" have undergone significant changes, indicating that through the support of information technology The reform of teaching mode pilot, improve students' information literacy and innovation ability [13].

This shows that the blended learning under the SCH-SPOC education mode enables students to receive passionate instruction from teachers in face-to-face education and guidance from different colleges and universities with different characteristics and styles. It realizes the mixture of the online teaching and the space-time teaching under the line, the mixture of the online network resources and the teaching resources of the offline classroom resources and the inter-school learning objects, which makes the teaching from the teaching-oriented to the school-based transformation, From the classroom to the combination of inside and outside the class to change, to impart knowledge to the ability to cultivate and improve the quality of change, which greatly promoted the teaching of teachers and students grow and achieve the advantages of multi-mode hybrid teaching vitality complementary.

#### **4. Summary**

Nowadays, new learning methods such as global learning, mobile learning and lifelong learning are changing the cognitive structure of learners. Nowadays, the deep integration of information technology and higher education has become the inevitable trend of higher education informatization.

The SCH-SPOC teaching model based on the concept of autonomic-collaborative-hybrid is beneficial to promote the sharing of high-quality resources, promote the individualized learning of students, promote the collaborative learning between students and students, and enhance the vitality of multi-modal blended teaching. Has a good effect. At the same time, for teachers to put forward higher requirements, teachers not only need to change their ideas from traditional knowledge transfer to guides, facilitators and evaluators,

but also require teachers to increase their teaching efforts to enhance their own numbers Media literacy; foster the way of thinking in the Internet age, pay attention to the construction and rational use of high-quality open educational resources, improve the ability of teaching information; strengthen teaching interaction in teaching practice, integrate online learning, collaborative learning and blended learning Kind of learning mode.

Therefore, teaching in the information age is not only an improvement of teaching techniques and teaching methods, but also a revolutionary change in which students 'learning and teachers' teaching work together.

## **5. Acknowledgements**

The research is supported by a Project Funded by the Flagship Major Development of Jiangsu Higher Education Institutions (No. PPZY2015B113) and Teaching Research Project of Yancheng Teachers University(16YCTCJY042).

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