Designing Path of SPOC Blended Teaching and Learning Mode in Post-MOOC Era

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***Abstract*—In the post-MOOC era, combining the respective advantages of traditional teaching models and MOOCs, SPOC is more suitable to apply the diverse teaching resources to small-scale and specific learners as an indispensable bridge between the traditional classrooms and MOOC platforms. With the outbreak of the COVID-19 pandemic, the urgent demand of long-distance online teaching had impelled Chinese teachers and students to make full use of the online teaching and learning techniques, thereof the SPOC blended teaching and learning mode had been widely adopted by national colleges and universities in China. Two surveys on the online teaching and learning platforms were carried out during the COVID-19 pandemic: a large-scale investigation on the undergraduates online teaching and learning in Beijing showed, the online learning students preferred SPOC for accessing adequate online learning resources; our online survey on SPOC online teaching and learning platforms at three higher vocational colleges in Anhui Province showed, the teachers and students held the positive attitude towards teaching mode, evaluation method, evaluation quantity, task exploration, and resource display, but learning resources, interactive platform, activity arrangement, classroom task, and communication quality to be improved. On the basis of comparison, investigation and interview on MOOC and SPOC, the study puts forward the designing method of SPOC blended teaching and learning mode, which consists of five teaching procedures of analysis, design, development, implementation and evaluation before, during and after the online teaching and learning.**

Keywords*—SPOC (Small Private Online Courses), MOOC (Massive Open Online Courses), educational information technology, blended teaching and learning mode, online teaching and learning

I. INTRODUCTION

Since 2012, the year of MOOC (Massive Open Online Courses), MOOC developing rapidly and explosively, online teaching and learning have become a research hot spot of teaching reform (Leontyev and Baranov, 2013; Scherjon et al., 2019), especially higher education. Thanks to the rapid development of mobile internet, educational information technology and big data, various educational platforms such as MOOC (Massive Open Online Courses), SPOC (Small Private Online Courses), Remote hands-on, and Lab as video game have emerged in large numbers worldwide (Waldrop, 2013), thus the increasingly vigorous and mature online teaching and learning have also entered a new post-MOOC era (ICEF Monitor, 2013), which has profoundly and subversively influenced the traditional teaching and learning. Furthermore, triggered by the educational information technologies, the new technology-based teaching and learning modes including blended learning and flipped classroom have become popular in the current educational research and practice. At present, in pace with the more and more mature construction of online education platforms, multiple open online teaching platforms such as Coursera, edX, and China University MOOC have been constantly developed.

In 2018, Education Informatization 2.0: Action Plan issued by Ministry of Education of the People's Republic of China proposed to energetically digitize the massive teaching and learning resources, and greatly develop 10000 national first-class courses, namely the online golden courses. At the beginning of 2020, after the outbreak of the COVID-19 pandemic, the whole country in China took strict isolation measures and stopped offline classroom teaching in all primary, secondary schools, and universities. The national teaching requirement of "Classes Suspended but Learning Continues" extended the traditional classrooms to large-scale online teaching and learning, thereof the teaching and learning method of SPOC had been widely adopted by national colleges and universities in China.

II. ONLINE TEACHING AND LEARNING PLATFORMS DURING THE COVID-19 PANDEMIC: TWO SURVEYS

In 2020, seriously influenced by the unexpected outbreak of the COVID-19 pandemic, the traditional classroom teaching and learning had to be substituted by large-scale online teaching and learning with teachers and students all at home, which not only challenged the practical limit of classroom teaching and learning, but also witnessed the harshest test of the effective informatization construction of China's higher education in the past 40 years. In practice, the online teaching and learning had pushed the blended teaching mode online and offline, the burgeoning mainstream of higher education reform, toward a rapid, comprehensive, and efficient developmental epoch of MOOC and SPOC.

During the COVID-19 pandemic, Ministry of Education of China had organized 37 main curriculum technical platforms

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including China University MOOC, Chaoxing, and Treenity, and actively motivated more than 100 social and university online teaching platforms to participate in the online teaching service support, over 24000 online courses provided free of charge. In addition, Tencent, Huawei, Alibaba and other internet enterprises had rapidly launched their own online teaching platforms, or added more individual online teaching and learning functions based on the prior online teaching services. Such a large-scale online teaching and learning would certainly bring about fresh challenges to the teaching platforms, teaching contents, teaching modes, and learning monitoring, and promote the sharing of high-quality curriculum resources, the backward force of teaching reform and the improve of educational and teaching quality at the same time.

In March 2020, Beijing Education Commission carried out a large-scale investigation on undergraduate online teaching and learning in Beijing, which could be regarded as a typical case representative of online teaching and learning during the pandemic in Chinese universities. Since Feb. 17, 2020, sixty-six universities in Beijing had started online teaching, and opened a total of 85414 undergraduate online courses by the midmonth of March, with 41405 teachers online teaching and 4109316 students online learning. Specifically, the teaching method of live broadcast was mainly adopted by university teachers (79.6%), then recording and broadcasting (29.2%), but 55.6% of the teachers had carried out online discussion, furthermore, up to 95.7% of the teachers had used their own course resources, 47.8% preferring the online teaching platforms of their own universities, but 82.7% were more likely to apply Wechat, QQ and other software. However, in sharp contrast to the online teaching preference, the online learning students preferred SPOC of recording and broadcasting in the hope of accessing adequate online learning resources (see Figure 1).

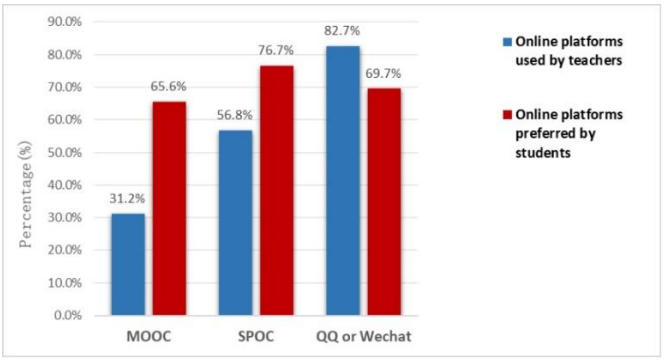

Fig. 1. Comparative evaluation of online platforms between teachers and students.

To figure out the online teaching and learning in higher vocational colleges during the pandemic, we conducted an online survey on teachers online teaching and students online learning in Maanshan Teacher's College, Maanshan Vocational And Technical College and Chuzhou Vocational And Technical College via Sojump the popular survey platform from May 18 to 27, a total of 1287 valid questionnaires (512 teachers and 775 students) received. Based on the findings of the questionnaire survey and the existing problems of online teaching practice, we interviewed some teachers and students who participated in online teaching and learning. The teaching method of SPOC was thereof acknowledged to be more suitable and effective for college online teaching, for it could avoid such defects of MOOC as the difficulties of graded teaching, monitoring and controlling the students' learning behaviors. The survey data showed that 85.7% of the students approved of the promotional effect of SPOC on their own online learning, while 96.4% of the teachers approved it; 97.8% of the students and 85.6% of the teachers approved of the resource presentation platform, looking forward to applying it in the future; moreover, the surveyed teachers online teaching and students online learning held the positive attitude towards teaching mode, evaluation method, evaluation quantity, task exploration, and resource display, but learning resources, interactive platform, activity arrangement, classroom task, and communication quality to be improved (see Figure 2).

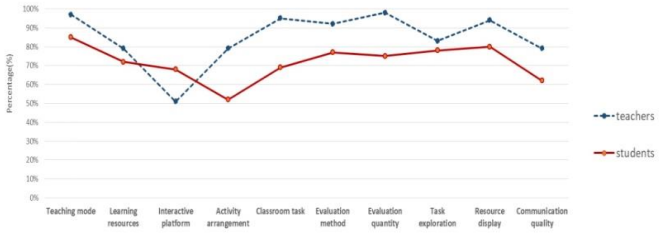

Fig. 2. Perceived use of SPOC platform by interviewed teachers and students.

III. Concise Comparisons of SPOC and MOOC

As a new online educational model, MOOC had gone through multi- stages of cMOOCs, hMOOCs and xMOOCs, and advanced towards the post- MOOC era of blended up-to-date online teaching and learning models, such as SPOC, pMOOC (personalized MOOC) and dlMOOC (deep learning MOOC) and so forth (Zhu and Liu, 2014; Zhang and Peng, 2018). In the post- MOOC era, combining the respective advantages of traditional teaching models and MOOC, small class teaching modes had been mostly adopted according to the specified characteristics of students and courses. In short, SPOC in the post- MOOC era is more suitable to apply the diverse teaching resources to small-scale and specific learners, and has become an indispensable bridge between the traditional classrooms and MOOC platforms (Fox, 2013; Fox et al., 2014; Scherjon et al., 2019).

MOOC has become so popular in the world due to its multiple advantages of being massive, open, online, interactive, and abound in learning resources. However, research findings showed that the universally acknowledged and widely accepted MOOC was suspected of posing as a overinflated myth in legend in practicability (Baggaley, 2014). MOOC has been proved to pose quite a few problems, such as single teaching mode, unclear evaluation methods, low completion rate of online courses, difficulty in personalized learning, and lack of emotional cultivation, therefore Armando Fox (2013), a professor of computer science at the University of California, introduced another new online educational model of SPOC with the purpose of solving these above problems. Stemming from MOOC, SPOC provides the new online learning resources, context and ideas for students to transform from external learning to internalized learning (Fox, 2013), and

surpasses MOOC in teaching form, teaching process, teaching structure, and operation mechanism.

For comparison, SPOC= MOOC+ Classroom (Hoffmann, 2014), and SPOC is MOOC with the fixed number of online learning registrants (ICEF Monitor, 2013) (see Table I). SPOC, the blended learning mode integrating the online education into offline classroom teaching, had been becoming a more efficient and popular teaching mode in the post- MOOC era (Goral, 2013; Kang, 2014; Scherjon et al., 2019). Stanford University, Duke University, and Tsinghua University had carried out the SPOC blended learning mode based on Flipped Classroom

TABLE I. COMPARISON OF SPOC AND MOOC

	MOOC	SPOC
Aim	*Outreach, targeted education of specific skills*	*Part of professional education; targeted education of specific skills*
Participants	*General public*	*Students enrolled at a university course*
Cost	*Free*	*Fees*
Number of students	*up to ∞*	*3–300*
Content and enrollment	*Open*	*Private*
Online	*100%*	*50–100%*
Formal credits	*Usually no*	*Yes*
Learning forms	*Online self study, online learning community*	*Blended learning, Flipped classroom*
Evaluation forms	*Online feedback, testing, homework, peer review*	*Online evaluation, classroom testing and interaction*
Student–teacher interaction	*Limited, if at all, online*	*Intensive, online*
Student-led learning	*Yes*	*Yes*
Prior knowledge requirements	*No*	*Yes*
Feedback to students	*Ample, automated*	*Ample, individualised*
Development strategies	*Develop courses with local characteristics to promote international communication*	*Develop the blended courses which meet the needs of cultivating talents in universities, and improve the teaching effect*

IV. DESIGNING PATH OF SPOC BLENDED TEACHING AND LEARNING MODE

In the E-learning environment of post-MOOC era, the blended teaching and learning employs the diverse media and information technologies to achieve their various teaching methods in the teaching process, which changes the traditional teachers' teaching modes and students' cognitive modes. The blended learning mode based on SPOC defines the learning process as the combination of information technologies, teaching technologies and various teaching forms (Driscoll, 2002).

A. General Approach of SPOC Blended Teaching and Learning Mode

As a whole, through the blended learning mode of O2O (Online To Offline), SPOC can effectively integrate online and offline learning, collaborative learning, autonomous learning, inquiry learning, as well as integrated connection before, during and after teaching, which has fundamentally changed the teaching and learning process of traditional classroom, and absolutely brought the online learning students the different learning experiences with higher quality. In the SPOC blended learning mode, the online learning students' autonomous learning initiative should be brought into full play in all constructing aspects, online and offline interaction. The SPOC blended learning mode should be designed practically and systematically by the students, teachers, as well as the curriculum team mainly composed of the teaching assistants and educational technicians.

More specifically, the SPOC blended learning mode effectively integrates the synthetical online and offline learning methods (Scherjon et al., 2019) including MOOC, SPOC, flipped classroom and face-to-face classroom, for example, the concrete multi-stage forms of Lecture & Review, Practice after lecture, Case review, Project exploration, Discussion & Debate, Talking & Practicing, Equal interaction, and Students Asking & Answering. SPOC blended learning courses selected for higher education can be implemented in large-class online teaching and small-class offline tutoring, then designed and recorded into the micro videos of knowledge units or case modules, with the attached teaching and learning resources of teaching program, teaching plan, recording and broadcasting resources, PPT courseware, e-books, research literature, quizzes and examination questions.

B. Designing Method of SPOC Blended Teaching and Learning Mode

Generally speaking, designing the SPOC blended learning mode consists of five teaching procedures of analysis, design, development, implementation and evaluation. In the preliminary phase of SPOC teaching analysis, the online teaching team should primarily analyze the online learning students, their learning contents and learning content, and then determine the online teaching objectives and develop the SPOC design resources accordingly. Before, during, and after the online teaching, the online teaching team should release the teaching resources on the SPOC teaching and learning platform, and the SPOC students should learn online at any time within the time given and complete the learning task, homework, and thesis design (see Figure 3). On the basis of the offline classroom teaching effect and online student feedback data, the online teaching team should carry out the formative evaluation according to the learning data on SPOC, the feedback quality of students' group work, the students' self-evaluation and group discussion, and dynamically adjust the teaching design and teaching content constantly.

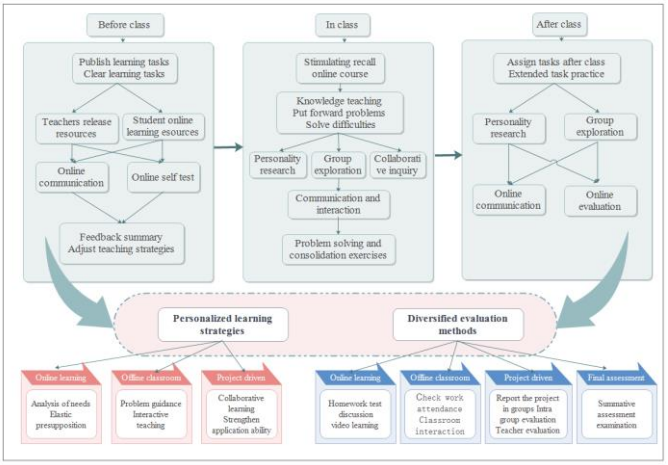

Fig. 3. Designing method of SPOC blended teaching and learning mode.

Guidance before class. Focusing on the deep integration of online and offline learning, the pre- class learning context of SPOC blended learning mode must be analyzed for the online learning students to develop an optimal teaching and learning ecosystem. First, the online teaching team analyzes the online students' learning needs, comprehensive quality, curriculum objectives and course contents, in order to determine which teaching approaches and teaching media to select. Second, the online teaching team records the teaching knowledge modules into 6-15 minutes teaching micro videos and prepares online questions, quizzes and discussion topics on an interactive online platform. Third, the online teaching team uploads the teaching objectives, teaching videos, teaching resources and practical projects to the SPOC teaching and learning platform. And then, the online teaching team communicates with the online learning students on the SPOC teaching platform, QQ groups, Wechat groups and other social platforms.

Self-study in class. Focusing on problems solving in class, the traditional classroom can play a greater role in promoting the deep interactions between online learning communities. First, the classroom teachers analyze the online learning data such as Who are learning, What to learn, How to learn, and How your learning by the learning analysis technologies, and then provide the ample targeted guidance to the students according to the learning data analysis results. Second, the classroom teachers explain and investigate the key points and special difficulties, and answer the students' questions collectively or individually. Third, the classroom teachers launch and participate in the group discussion, and cooperate the thematic exploration with the students together. And then, the classroom teachers evaluate and comment on students' learning performance, and demonstrate their excellent assignments and achievements.

Practice learning after class. The SPOC blended learning mode can provide the real-time feedback for the online learning students via its cloud intelligent evaluation, whose visual feedback of the online learning data can help the students to adjust their learning state, improve their learning efficiency and optimize their learning effect in the SPOC online learning platform at any time. First, based on the SPOC platform and extracurricular innovation practice platforms, the online teaching team assigns and uploads the assignments, quiz, and innovative projects to the SPOC online teaching and learning platform. Second, the online teaching team collects and comments on the students' homework and research works through the SPOC database and social platforms. Third, the online teaching team launches the online topic discussions, and marks and corrects the students' homework online. And then, the online teaching team analyzes the actual mastery of the curriculum contents of the diverse students in different time periods through the SPOC big data, which will provide an important basis for improving their teaching objectives, optimizing their teaching strategies and enhancing their teaching efficiency in the future.

V. Conclusion and Implications

In sum, MOOC has brought the modern higher education new teaching ideas, teaching models and large-scale, online, open, high-end and shared high-quality teaching resources, and brought along a huge shock to the traditional classroom teaching by various new teaching and learning methods such as ubiquitous learning, blended learning, flipped classroom, autonomous and interactive learning, online and offline teaching. At present, the post- MOOC era marked by the timely emergence of SPOC had come, and the teaching and learning modes have transformed from so-called autonomous online learning to blended learning, flipped classroom, collaborative learning and research-based learning. Compared with MOOCs, micro courses, quality courses and other teaching modes, SPOCs can be regarded as the well-timed epitome integrating and assimilating most of their advantages, and overcoming the intrinsic disadvantages of MOOCs to a great extent.

During the COVID-19 pandemic, the urgent demand of long-distance online teaching had impelled Chinese teachers and students to change their inherent teaching and learning concepts gradually, and then they could make full use of the online teaching and learning techniques, from earliest accepting the online teaching and learning to more and more proficient step by step. The widespread applied SPOC blended teaching and learning mode in Chinese colleges and universities had achieved the established educational objectives of Student-centered Teaching and Self-regulated Learning. The SPOC blended learning mode focuses primarily on the optimal integration of the online teaching and learning and face-to-face classroom, and encourages the teachers to continue pushing forward the online curriculum reform and sharing the high-quality teaching and learning resources, and meet the students' diversified learning needs to the greatest extent.

Wu Yan, the director of the Department of Higher Education, said frankly at the press conference of Ministry of Education on May 14, 2020: "We can never and should never return to the past teaching and learning state before the epidemic, for the online teaching of Internet + Intelligence + Technology has become a predominant development trend of the higher education in China and the world." In the post-epidemic era and post-MOOC era, the online learning should be the main learning mode of distance education, which would necessarily put forward the new requirements for the existing SPOC blended learning mode. In the future, the further

application of SPOC blended teaching and learning mode in college teaching needs to be researched and improved by more researchers and practitioners.

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