

Exploration and Practice of Blended Teaching Model Based Flipped Classroom and SPOC in higher University

Xin-Hong Wang, Jing-Ping Wang, Fu-Ji Wen, Jun Wang, Jian-Qing Tao

School of Chemical and Environmental Engineering, Yancheng Teachers University, Jiangsu, 224051, China

Corresponding author (Wang, X. H.): Tel: +86 515 88233187 E-mail: wangxhong1227@163.com

The research is financed by a Project Funded by the Flagship Major Development of Jiangsu Higher Education Institutions (PPZY2015B113).

Abstract

SPOC is characterized by improving teaching effectiveness. Currently open teaching mode is the popular trend, which is mainly related to several aspects: how to carry out teaching practice by using MOOC proprietary, high-quality online teaching resources in open education, that is, deep integration of curriculum resources and teaching design. On the basis of SPOC development, combined with open education analysis of SPOC with instructional design theory and philosophy from flipped classroom as a guide, the present research try to propose instructional design model based on flipped classroom, including design of teaching content system, design of personalized learning strategies, design of teaching activities and teaching evaluation system. Four designs above contribute to the effective implementation of the open teaching activities based on the blended model of flipped classroom and SPOC teaching, so as to enhance the quality of education.

Keywords: Teaching design model; SPOC; Teaching methods; Flipped classroom

1. Introduction

Traditional colleges and universities gradually become open, flexible, lifelong, which is an important trend of the world universities conform to the current social transformation into the learning society (Yuan et al., 2014). The Open universities have been at the forefront. Its most important characteristic is to flexibly extract views or ideas from international experts in relevant fields, and to adequately spread these high-quality open sources by some means. The construction system of MOOC (Massive Open Online Course) reflects the school characteristics of the open universities (Hollands & Tirthali, 2014). The development of modern distance education continuous with the development of information technology, and the deep combination of information technology and education has also become a common philosophy and consensus in constructing building open university (Viswanathan, 2012). The emergence of MOOC is an important direction, achieving the deep integration of the Internet and open education resources, so that single open educational resources gradually becomes into massive open online courses with teaching process, the evaluation system and a good learning experience (Liyaganawardena et al., 2013).

Despite its large size, open, interactive, rich resources of MOOC and other characteristics can meet the needs of different levels of learners, the relevant literatures and integration platform data analysis show that there are many problems in our open education, such as low course completion rate, difficult achievement of personalized learning, single teaching mode, blurry assessment and certification mode, and lack of training of emotional values and humanism, etc. (Hew & Cheung, 2014). To solve the above problem, a professor at Berkeley University of California, Armando Fox proposed SPOC (Small Private Online Course) in 2013. Armando Fox believes that MOOC is only supplement of classroom teaching, and can't completely replace classroom teaching. When MOOC is able to improve the utilization of teachers, to increase students output, to improve students' learning ability and study participation, this model can be called SPOC (Fox, 2015; Goral, 2013). In the teaching form, SPOC committed to blended learning, helping to integration of MOOC advanced thinking and face to face teaching. To this end, the MOOC teaching content and technology is combined with a variety of instructor-led activities to achieve an effective reversal to different teaching objectives, teaching content and learner characteristics (Watson et al., 2016). SPOC can change the status of traditional classroom teaching, and is new hybrid mode of the integration of online learning and traditional classroom for small scale, specific

population by using MOOC resources and online evaluation, communication and other functions (Teplechuk, 2013).

Flipped classroom is considered to be an effective way for blended learning. As a high-quality open educational resource, SPOC is a good support for carrying out flipped classroom teaching. "Small-scale" and "proprietary" of SPOC is also a favorable condition for flipped classroom teaching. The MOOC ideas are implanted into flipped classroom, and the teaching effect is optimized then when sharing of quality resources can be achieved on MOOC teaching platform (Root, 2014). So teaching practice based on flipped classroom is inevitable.

2. SPOC domestic situation analysis

May 8, 2014, the Chinese University of MOOC platform is online. February 2015, more than 300 online courses from 121 partner universities are added onto MOOC platform. The number of users exceeded 100 million. In 2014, many colleges and universities begin to focus on MOOC classroom applications (Chen & Yang, 2015). Therefore, MOOC platform from China University began to add "SPOC zone", in order to support quality educational resources sharing between schools, which can optimize classroom teaching of teachers. From 2013, the domestic colleges and universities have conducted about SPOC teaching attempt. A total of 85 SPOC/MOOC courses from 51 universities are on line on Chinese MOOC platform. Zhejiang University curriculum launched CNSPOC cloud platform to support flipped classroom, case studies, collaborative learning, immersion learning and mobile learning. SPOC-based teaching applications become a hot topic in the future of the field of education (Zheng & Yang, 2014).

In summary, the relevant SPOC construction has been the bridge of MOOC lesson from the "platform technology" to "classroom teaching" (Bulfin et al., 2014). However, according to online SPOC courses and literature on SPOC, most researches and constructions of SPOC still stay the stage of providing curriculum resources for learners (Caswell et al., 2008), and lack of instructional design model, model of teaching activities, monitoring and learning evaluation methods. Then, the research for the above problem is imperative (Downes, 2013).

3. Flipped classroom instructional design model based on SOPC

Fox thinks that SPOC is mutual integration with MOOC and the traditional classroom model (Abeysekera, & Phillip, 2015), which can enhance the teaching methods of teachers, students' throughput, students' mastery and involvement (Pirkle, 2014). Based on SPOC's flipped classroom instructional design model, the present research includes the design of teaching content system, the design of learning strategies, the design of teaching evaluation system and the design of teaching and learning activities, as shown in Fig. 1.

3.1 Designed for teaching content system

The platform system including SPOC platform and flipped classroom platform is established according to the need of learning characteristics and learning needs of learners, which embodies the following four modules: basic course information, learning content, teaching activity and interactivity module.

Design of teaching activities is one part of teaching content. Teaching activities mainly refer to the sum of

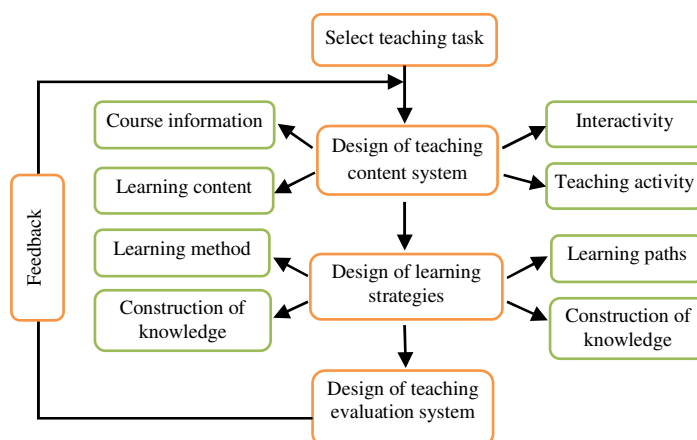


Fig. 1 Flipped classroom instructional design model Based on SOPC

learning-related activities to achieve specific learning goals or teaching effectiveness. According to flipped

classroom model proposed by domestic and foreign scholars, combined with learner characteristics and activity-oriented theory, we try to build a diverse model of teaching design (Hung et al., 2008). The teaching model is divided into two modules SPOC platform design and flipped classroom teaching activities design (Fig. 2).

(i) Basic information of course

Course modules include basic information on the course outline, objectives introduction, learning time requirements, reserving requirements of prerequisite knowledge, scoring methods and standards, credits and certificate issuance and so on.

Course modules include basic information on the outlines, learning objectives, learning time requirements, reserve requirements prerequisite knowledge, scoring methods and standards, credits and certificate issuance requirements and so on. Designs of course outline, learning objectives are to be simple, clear. Design of learning time is to be reasonable, and also to reflect the flexibility of SPOC learning. The reserve requirements for prerequisite knowledge are to a detailed and comprehensive presentation, so that learners can be performed according to the requirements to decide to enter the learning path. Scoring and standards design should be timely, scientific, easy and accurate for the learner, in order to promote the motivation and initiative of learner to improve the completion rate MOOC courses.

(ii) Design of learning contents

Design of learning content is in conjunction with the above four themes as a design concept. The course content on SPOC platform are to be focused on the core and important conceptual and memory type knowledge, while in flipped classroom a good learner-centered learning experience is designed in the main form of learning content in solving problem, inquiry personalized significance in SPOC curriculum knowledge and knowledge of the construction aspect, cultural experiences and emotional culture, etc., which develop students' interest in learning, mastery learning skills, develop good study habits, to facilitate to explore self-learning after school. The novel design of learning content, meeting the needs of the learners, and teachers targets in answering questions in the flipped classroom. Such instructional design helps to improve students' motivation to learn problems and enhance learning outcomes.

3.2 Design personalized learning strategies

Learning strategies is to effectively control the process of learning knowledge for the learner, in order to high efficiently store and retrieve information. The diversity of motivation and background of learners decide on learning paths and learning outcomes. Thus design of personalized learning strategies is to not only meet the individual needs of learners, but also support the diverse participation and learning for learners.

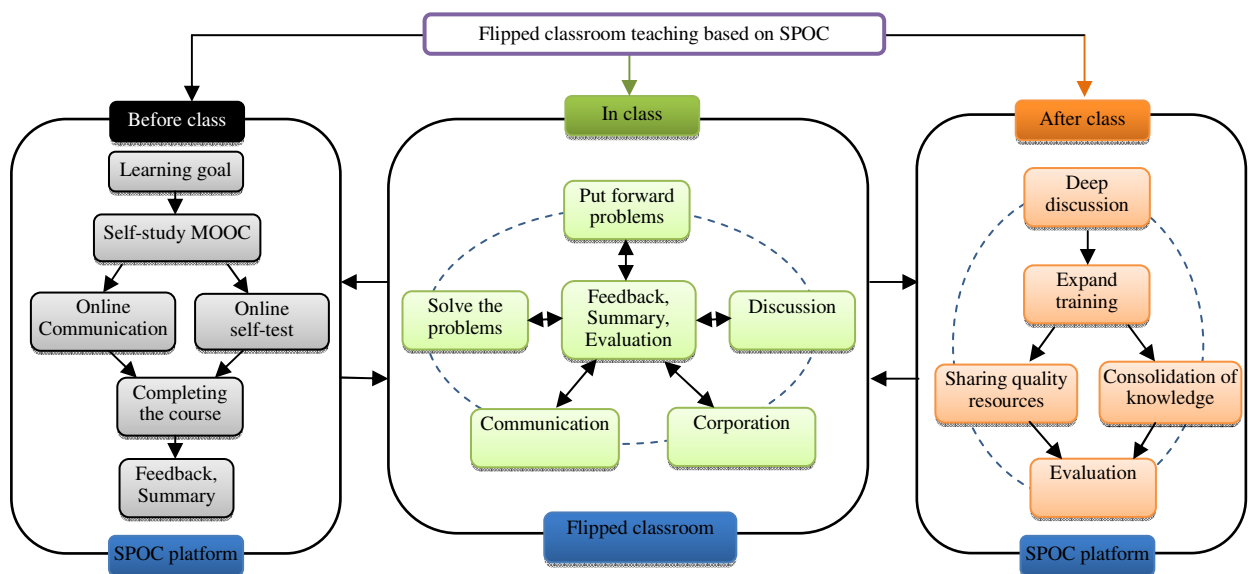


Fig. 2 Design of teaching activities diversity model

3.4 Designed of diversified teaching evaluation system

Design teaching evaluation system based on mainly learning assessment system is diversified teaching evaluation system containing technical analysis, process evaluation and summative evaluation.

The evaluation system included assignment, unit testing and performance in the discussion group (obtained in term of the level of activity, peer review methods available) on SPOC platform, as well as classroom assignments and performance in face to face teaching (mainly obtained through self-evaluation and teacher evaluation). According to the learners variable in the learning activities, the relevant data is firstly extracted, and followed by qualitative analysis of the data, then the similarity of quantitative learners and clustering analysis, and finally give the effective intervention process for teachers and education administration. Secondly, small test in the game form or exploratory test can be designed in the process of teaching to increase learning guide, which facilitate learners to master the content and its application. Summative evaluation of learners is comprehensively achieved through online and traditional school final exam. Such diversified learning evaluation can fully reflect the effects of learners in the teaching, and more conducive to improve the initiative of learners (Wang et al., 2011).

4. The study of the application case

4.1 Specific practice cases of teaching reform practice

Author and teaching team firstly opened course "Chemical Engineering Thermodynamics" in self-learning platform in our school. That is the first large-scale open teaching practice. Teaching platform is divided into six parts including instructional videos, electronic courseware, assignments, online testing, discussion, performance records and evaluation. Teachers can maintain and update the featured content of the course in the background. Survey data are obtained through interviews, depth interviews (questionnaires) and students' feedback. The data and experimental results are analyzed by applying content analysis.

Chemical Engineering Thermodynamics is a comprehensive and practical course for learners, and learners have relatively high comprehensive quality. Learners will encounter many learning difficulties, such as the weaker theoretical foundation, less time, poor logical thinking. Therefore, learning resources from SPOC and effective teacher-student interaction is essential to enhance teaching effectiveness of this course.

Table 1 Specific teaching modules of activity design

Section number	Section IV		
Hours	SPOC course: unlimited		Flipped classroom: 2 *45 min
Contents	Thermodynamic properties and thermodynamic chart of two-phase systems		
Goals	1. Master the calculation method of pure substances properties in two-phase region 2. Learn to use common thermodynamic chart		
Time	Before class: SPOC	In class: Flipped classroom+ SPOC	After class: SPOC
Content design	Browse and the related contents on the SPOC platform, access to relevant information	1. Explain the important and difficult points by teacher 2. Design and display by students 3. Peer review by students 4. Feedback and summary by teacher	1. Modify and improve work 2. Online communication between teachers, students and teams 3. Teachers upload learning resources on SPOC platform
Learner	Students as a teaching assistant	Student and teachers study together	Student and teachers study together
Activity level	Understanding	Application, evaluation and reflection	Application, understanding
Evaluation	Learning experience, Depth Training, Classroom presentations, discussion, etc.		

According to the learner and cognitive characteristics, teaching design tables based on the design of specific course content of SPOC course and flipped classroom are designed according to instructional design theory. Activities design should specify the content of activities, learning objectives, learners or learning community, operating procedures, activity level, evaluation criteria and so on. The specific teaching modules of activity design are shown in Table 1.

4.2 Effect Analysis

In order to verify the teaching effectiveness based on SPOC courses and flipped classroom teaching design through specific teaching, the relevant learning feedback is obtained through the questionnaire. The survey

includes students' personal background, understanding of the flipped classroom and SPOC, and the expectations of this course. By focusing on the formal interview before class, we found that most learners are more accustomed to the traditional classroom teaching, less deep understanding for MOOCs and other related network teaching platform (only browsing course information on platform, few learners adhere to completion a course on the platform). Many students have some doubts about flipped classroom learning outcomes based SPOC course, but most learners are willing to try new instructional design model.

(i) Learning feedback of SPOC courses before class

Learning feedback is an important manifestation of the extent of access to knowledge, and is helpful for students to understand the learning outcomes. After completion of learning on SPOC platform, a questionnaire was performed to know learning feedback of SPOC courses before class (Table 2).

Table 2 Survey data of learning SPOC course before class

Questions	Selection terms	Students number	Percentage (%)
Are you able to complete a SPOC course before class?	Very good	32	16.75
	Moderate	66	34.55
	Good	76	39.79
	Not good	17	8.9
How much time do you spend learning SPOC course?	Less than 30 min	18	9.42
	About 30 min	132	69.11
	More than 30 min	41	21.47

Survey data show that learning SPOC courses before class, all learners can successfully completed SPOC learning tasks; more than 80% of students can submit their assignments within the stipulated time, the majority of learners can get good grades after the end of the study. Question 2 is "How much time do you spend learning SPOC course?", whose results show that more than 78% of learners can finish within 30 minutes, which fully confirms the SPOC curriculum can continue to develop and can be expanded.

(ii) Analysis of survey on effect and recognition of the model

Random interviews and questionnaires are important method to understand the recognition of instructional design model by learner. As shown in Table 3, the results show that the learning mode itself has a very large role in promoting for nearly 31.93% learners, 38.22% learners think more large effect in promoting learning, only 24.08% learners think general effect in promoting learning, while 5.76% learners thinks that this learning mode has no effect. At the same time, 89% learners are satisfied with the model, and expect to continue to use it, but 6.8% learners do not like the teaching model. These data suggest that such learners instructional design model has a relatively high recognition.

Table 3 Survey of recognition of instructional design model by learner

Questions	Selection terms	Students number	Percentage (%)
Do you think whether SPOC and flipped classroom teaching is benefit to your study?	Very large effect	61	31.93
	More large effect	73	38.22
	General effect	46	24.08
	No effect	11	5.76
Are you satisfied with the teaching design?	Very satisfied	28	14.66
	Satisfied	124	64.92
	General Satisfied	26	13.61
	Dissatisfied	13	6.8

5. Conclusion

MOOC is so a big storm of online education that many educators are full of their passion and desire. Combination with the SPOC and flipped classroom teaching mode will help universities to further implement the reforms in learner-centered teaching and learning methods, which is in line with educational philosophy and culture features of many colleges and universities. By verifying the validity of the flipped classroom based on SPOC instructional design model, we obtained the following enlightenments for flipped classroom teaching: (i) to carry out diverse teaching modes. The supporter of SPOC and flip classroom learning model should firstly change a single teaching mode into diversified, hierarchical mode of teaching for different learning content and learners so as to provide personalized guidance. (ii) to build a mature network platform. Few resources and rough platforms led to the slow development of open education, while the mature, systematic network platform contributes to more effectively flipped classroom teaching. (iii) to strengthen team cooperation of teachers and

intelligence training. The technology development can change teachers' functions. Teachers need to carry out the design of more detailed course content and learning activities for personalized learning to adapt to teaching mode reform based on SPOC's flipped classroom in the future.

References

- Abeyssekera, L., & Phillip, D. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. *Higher Education Research & Development*, 34, 1-14.
- Bulfin, S., Pangrazio, L., & Selwyn, N. (2014) Making 'MOOCs': The construction of a new digital higher education within news media discourse. *The International Review of Research In Open And Distributed Learning*, 15(5), 290-305.
- Caswell, T., Henson, S., Jensen, M., & Wiley, D. (2008). Open content and open educational resources: Enabling universal education. *The International Review of Research in Open and Distance Learning*, 9, 1–11.
- Chen, R. & Yang C. (2015). New Blended Learning Mode Based on SPOC. *Journal of Jiangsu Radio & Television University*, 2, 44-48. (in Chinese with English abstract)
- Downes, S. (2013). MOOCs will ultimately play a transformational role. In *Half an Hour, Blog*, November 6, 2013. <http://halfanhour.blogspot.co.uk/2013/11/moocs-will-ultimately-play.html>
- Fox, A. (2015). From MOOCs to SPOCs [DB/OL]. [2015-04-24]. <http://cacm.acm.org/magazines/2013/12/169931-from-moocs-to-spocs/fulltext>.
- Goral, T. (2013). SPOCs may provide what MOOCs can't. *University Business*, July 2013. <http://www.universitybusiness.com/article/spocs-may-provide-what-moocs-can%E2%80%99t>
- Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. *Educational Research Review*, 12, 46–58.
- Hollands, F. M., & Tirthali, D. (2014). MOOCs: expectations and reality. Full report. Center for Benefit-Cost Studies of Education, Teachers College, Columbia University, NY. http://cbcse.org/wordpress/wp-content/uploads/2014/05/MOOCs_Expectations_and_Reality.pdf
- Hung, S.P., Huang, H.Y., Lin, S.S.J. (2008). Do Significant Others' Feedback Influence Ones' Creative Behavior? —Using Structural Equation Modeling to Examine Creativity Self -Efficacy and Creativity Motivation Mediation Effect. *Bulletin of Educational Psychology*, 40, 303~322.
- Liyanagunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: A Systematic Study of the Published Literature 2008-2012. *The International Review of Research in Open and Distributed Learning*, 14, 202-227.
- Pirkle, H. (2014). Arabic MOOC platform Edraak launches to bring quality education to the region. In *Wamda Blog*, June 15, 2014. <http://www.wamda.com/2014/06/first-arabic-mooc-platform-Launches-quality-education>.
- Root, K. M. V. (2014). Canine Theriogenology for Dog Enthusiasts: Teaching Methodology and Outcomes in a Massive Open Online Course (MOOC). *Journal of Veterinary Medical Education*, 41: 9-18.
- Teplichuk, E. (2013). Emergent models of Massive Open Online Courses: an exploration of sustainable practices for MOOC institutions in the context of the launch of MOOCs at the University of Edinburgh. MBA Dissertation, University of Edinburgh. https://www.era.lib.ed.ac.uk/bitstream/1842/7536/1/MOOCs_MBADissertationTeplichuk_Master.pdf
- Viswanathan, R. (2012). Teaching and Learning through MOOC. *Frontiers of Language and Teaching*, 3, 32-40.
- Wang, T.T., Su, X.H., Ma, P.J., Wang, Y.Y., Wang K.Q. (2011). Ability-training-oriented automated assessment in introductory programming course. *Computers & Education*, 1, 220-226.
- Watson, W. R., Kim, W., & Watson S. L. (2016). Learning outcomes of a MOOC designed for attitudinal change: a case study of an animal behavior and welfare MOOC. *Computers & Education*, 96, 83-93.
- Yuan, L., Powell, S., & Olivier, B. (2014). Beyond MOOCs: Sustainable Online Learning in Institutions – A white paper. Cetus – Centre for Educational Technology, Interoperability and Standards. <http://publications.cetus.org.uk/wp-content/uploads/2014/01/Beyond-MOOCs-Sustainable-Online-Learning-in-Institutions.pdf>
- Zheng, Q., & Yang, Z.J. (2014). SPOC: intergrating innovation of combing with university education. *Physics & engineering*, 24, 15-18. (in Chinese with English abstract)