The Teaching Design of Computer Network's Flipped Classroom Based on Fanya SPOC Teaching Platform*

LIU Yang

Binzhou University, Shandong, China

With the emergence of new Internet technologies, such as IPV6 (Internet Protocol Version 6) and Internet of things, the content of computer network course is increasing year by year and the contradiction between limited teaching time and increasing teaching content appears. The widespread use of mobile Internet and the popularization of intelligent electronic devices make it difficult for students to focus their attention completely on the classroom. In view of the above two points, this paper redesigns the computer network classroom by using the Fanya SPOC (Small Private Online Course) teaching platform and adopting the teaching mode of flipped classroom to stimulate students' interest in learning and improve their learning effect.

Keywords: SPOC, flipped classroom, teaching design

Introduction

At present, the teaching mode about the computer network course can be divided into two types: One is the traditional teaching mode based on the classroom teaching, which is teacher-centered and is widely used in various colleges. The other one is the flipped classroom, which is student-centered and pays attention to interaction between teachers and students, showing that it is able to effectively motivate students' learning interest and improve the learning effect. In recent years, the second one has been gradually introducing in teaching. With the development of information technology, ubiquitous Internet has the structured influences on college teaching and has profoundly affected and changed people's educational philosophy and learning method. This paper will elaborate how to use Fanya SPOC teaching platform and realize computer network's flipped classroom in detail.

Small-Scale Limitation for the Online Course SPOC

Small Private Online Course (SPOC) is an online course explored by Professor Armand Fox in University of California Berkeley in 2013. Mentioned by the president of edX and Professor Anant Agarwal of Massachusetts Institute of Technology, SPOC is a branch of MOOC (Massive Open Online Courses), defined as "SPOC = Classroom + MOOC" (Hoffmann, 2013). The difference of SPOC and MOOC is shown as follows: SPOC applies the refined teaching and limits the scale of students, ranging from dozens of people to hundreds of people. Meanwhile, it sets up the restrictive entry conditions for students. Only applicants who reach the requirements can be brought into SPOC course (CHEN, 2015). Compared with the traditional teaching mode,

* **Acknowledgements:** This research was financially supported by the Online course construction project of Binzhou University (No. BYZXKC201609) and the 12th five-year Plan of Education Science in Shandong province (No. YB15024).

LIU Yang, professor, master, Department of Information and Engineering, Binzhou University, Shandong, China.

the learning mode of SPOC makes students have elasticity in time and space. There are various types of teaching. Since SPOC limits the number of students, teachers are able to spend more energy focusing on students. If teachers teach students in accordance with their learning differences, they can effectively ensure students' learning effects, so as to enhance teaching quality. SPOC divides learning time into online study and offline study. Students study by themselves by watching a video or looking up relevant data and then do exercises for evaluation. Teachers regularly give the specific tutorship to students, thus students study under the supervision environment and ensure participation of study and course completion rate, so as to improve learning quality.

Flipped Classroom

Flipped Classroom is a new teaching mode created by the Internet, especially the mobile Internet. It is a complete subversion of the traditional teaching concept, instructional design, teaching organization and teaching management, and the role of teachers and students. The time in and out of the classroom has been readjusted and the decision to learn is transferred from the teacher to the student. The general practice is that the students study autonomously by watching course videos, lectures or searching related materials, reading books, etc. Students can plan their own learning schedule, learning content, learning style, and new knowledge according to their own situation. They can also internalize knowledge and deepen understanding by doing exercises, discussing with teachers or students, doing hands-on work, and participating in projects. According to Edgar Dale's theory of learning pyramids, the learning effect of individual learning or passive learning is less than 30%, while that of team learning, active learning, and participatory learning is more than 50% (GUO & HUANG, 2017). Therefore, flipping classroom can effectively improve learning efficiency. It is gradually accepted by the majority of educators and promoted.

The Teaching Design of Computer Network's Flipped Classroom Based on Fanya SPOC Teaching Platform

The course of computer network is a compulsory course for Information Specialty, which is a subject that combines computer technology with communication technology. The course has many knowledge points and boring contents, involving a large number of concepts, protocols, and principles. Students should not only master the basic principles of computer networks, but also be able to explain network phenomena by using the principles of networks, analyze, and solve the network problems. Traditional teaching mode is difficult to arouse students' interest. With the emergence of cloud computing technology, Internet of things, IPV6 technology, and other new technologies, curriculum content is increasing and the contradiction between the limited teaching time and the growing content of teaching is prominent (HU & GAO, 2017). On the other hand, the major group of college students today is the post-95 generation, a generation that has grown up with the Internet and smart electronic devices. They are used to learning from the Internet using smart devices. Combined with the above two points, the computer network classroom is redesigned by using the SPOC teaching platform and the teaching mode of flipping the classroom will be more helpful to stimulate the students' interest in learning and improve the learning effect.

Fanya SPOC Teaching Platform

Fanya SPOC teaching platform is an integrated network teaching platform with interactive teaching function, resource sharing function, mobile learning function, and teaching portal function. And it is released

by Chaoxing. By using this platform, teachers can implement course construction, teaching process supervision, and course resource sharing. Students not only accept the independent supervised study based on this platform, but also make use of the functions for discussion and testing.

Fanya SPOC Online Teaching Resource Construction

Online teaching resource construction can learn from the top-down stepwise refinement method in the procedure design. In order to complete the top design of course teaching resource construction, tasks to be completed are decomposed into several subtasks and then each subtask is downward decomposed step by step until all subtasks are easy for realization.

The top design of the course

Basic situation of the course. First of all, it is necessary to define the learning objects of this course, confirm the positioning of professional talent cultivation target in this course, and know about prerequisite courses and subsequent courses, nature of the course, teaching contents, problem-solving, gains of learning this course, and how to assess students. These contents are the basic information of the course and must be defined at the beginning of the course construction.

Course target. Curriculum goals can be refined into three dimensions: knowledge goals, ability goals, and quality goals. The knowledge goal is based on making students learn knowledge, the ability goals aim at students' ability to learn, and the quality goal is the quality other than the knowledge goal and the ability goal. For example, by aiming at students in computer science and technology of application-oriented universities, 3D targets of Computer Network Course can be described as follows:

(1) Knowledge target: Through the course study, students can deeply know about the basic concept of computer network, basic principle, and basic methods, know about OSI/RM, TCP/IP network system structure, systematically master functions and main protocols of five-layer computer network system structure, and master operational process and working principle of core equipment in computer network;

(2) Ability target: Through the course study, students can apply the learned computer network principle to explain the network phenomenon and show the ability to analyze and solve the practical network problems;

(3) Quality target: This course can cultivate students' tough learning character and serious working attitude.

Hour distribution and knowledge points. According to the course orientation and course target, hours and credits of this course are confirmed, so as to confirm the duration of the course video resources. Generally speaking, 16 hours belong to one credit. Duration of one credit is not less than 120 min. One knowledge point ranges from 7 min to 15 min. Generally speaking, it is 10 min. Duration of each knowledge point should not be too long. If the knowledge point is relatively complicated and it cannot be explained clearly in 10 min, it is necessary to further subdivide it. By taking computer science and technology as an example, Computer Network generally has 64 hours and four credits. Based on the above-mentioned calculation method, the number of knowledge points probably should be 48. Of course, according to the different cultivation schemes in each college, the number of knowledge points can be suitably adjusted, but it should cover the main teaching contents in the syllabus.

Teaching resource construction

The teaching design process of each knowledge point. Instructional design is based on the requirements of curriculum standards and the characteristics of teaching objects, the elements of teaching are arranged in an

orderly manner, and appropriate teaching plans are determined (Gagne & WANG, 2017). In the process of instructional design, we should generally start with “why to learn”. To establish the teaching goal, the difficult and important parts in teaching, the appropriate teaching method is adopted according to the teaching content. For example, when explaining the concept of stratification of computer network, it is difficult to understand because the concept of layering design is abstract and difficult to understand. In designing this part of the teaching, we can introduce and carry out analogy from the modular design idea of programming, and then explain it, so that students can understand it. It is easier.

Teaching design can take multiple forms. Here several common forms are enumerated. For example: (1) target introduction for explanation, case, or example teaching for further understanding and summary; (2) case introduction, cause analysis, theory, knowledge expansion and summary; (3) demonstrative introduction, decomposition explanation, error analysis, abstractive summary and summary; (4) case introduction, principle explanation, knowledge application and summary. The specific teaching design selection can be rationally selected in accordance with the features of learning contents and learning objects.

Exercises and homework preparation. In order to help students test their learning effects at a certain knowledge point and to enable the teacher to master the learning situation of each student, a proper number of in-class tests should be inserted into the video of each knowledge point, only if the test is passed. Usually, the number and type of questions should not be too complicated. As a test question inserted in the middle of the video, you can choose the topic mainly, but as a unit test or phase test, the question type can be a multiple choice question, short answer questions, calculation questions, and other forms. At the same time, the use of the SPOC platform can be also assigned to students' homework, regularly issued.

PPT, lecture and video recording.

(1) Make PPT: According to the teaching design of each knowledge point, PPT is made. PPT should be simplified as much as possible and also should be exquisite to stand out points. PPT should not have too many characters. Colors should be limited to three kinds. Illustrations or videos should be high-definition. The external materials introduced should give references;

(2) Write a lecture: Lecture is expressed by teachers from starting to the end when teachers record each knowledge point. The number of lecture characters should be limited to 2000. For a video with the duration of 10 min, the speed of each minute is about 200;

(3) Record a video: To record a video is a crucial step. In general, professionals should record and edit a video. Of course, if expenditure is limited and users of online course are restricted to the students in this school, non-professionals or teachers can finish video recording for not high requirements for video effects.

Teaching Design of Offline Course

The flipped classroom based on Fanya SPOC teaching platform is not the simple “online teaching+offline teaching”. Both of them should be mutually supplemented to promote more effective study for students. Students utilize online independent study, while teachers determine offline classroom contents in line with feedback of online data to realize the integration between online study and classroom teaching (HU & CHEN, 2017). Offline classroom teaching design means that students have certain knowledge foundation through online independent student to deepen and internalize study, thus online learning effect of students will directly affect contents and effects of flipped classroom, requiring teachers to intensify supervision, timely gain students' learning performance, and effectively guide them. Teaching content selection of offline teaching can come

from the following aspects: One is the typical error of students' online independent study. For example, in the learning network layer, about sub-network division and CIDR (Classless Inter-Domain Routing), students will make various errors. By aiming at such a situation, teachers should firstly collect the typical error cases shown in students' online independent study, give specific explanation or appoint students to explain it in the offline classroom, and finally summarize it. The second one is the key point and difficulty of the course teaching. For instance, as teaching the transportation management of TCP (Transmission Control Protocol) protocol in the transmission layer TCP, three-way handshaking and four-way handshaking are key contents of teaching and difficult contents, but if students just depend on online videos and character resources for study, students may not understand profoundly, thus by aiming at such contents, we can particularly select some exercises and cases, guide students to mutually exchange and discuss in different groups, and give the groups' solutions. Then, teachers will summarize it. The third one is knowledge expansion. Subject contests, certificate tests, and graduate school exam tests over the years or practical network engineering cases are introduced to the classroom to guide students to use the learned network knowledge to solve practical problems. Based on the specific situations of offline teaching, teachers should summarize in time or arrange certain student to straighten out knowledge in each class to take study notes, which will be audited by teachers. With the approval of teachers, this part should be timely uploaded to SPOC teaching platform to share with everyone.

Conclusion

This paper introduced SPOC and flipped classroom to the course teaching of computer network and elaborated the design process of online course and design method of offline teaching. Compared with the traditional teaching mode, this teaching mode proposes a higher requirement for teachers. First of all, teachers should construct relatively complete online teaching resources before class, continuously focus on online study of students, adjust online and offline teaching contents, teaching schedule and teaching methods based on it, and report study performance of students' offline teaching. In terms of students, such a teaching mode contributes to developing students' initiative and independence, motivating students' learning interest, and effectively improving learning effects.

References

- CHEN, W. W. (2015). MOOC, SPOC, microcourse, flipping classroom: Concept differentiation and application reflections. *Journal of Nanjing Xiaozhuang University*, 11(6), 117.
- Gagne, & WANG, X. L. (2017). *The principle of teaching design*. China: East China Normal University Press.
- GUO, F. Y., & HUANG, Y. L. (2017). Construction and practice of mixed teaching model based on SPOC in computer basic curriculum. *Chinese Medicine Education ECM*, 36(1), 46.
- Hoffmann, R. (2013). *MOOCs-best practices and worst challenges* [EB/OL]. Retrieved from <http://www.aca-secrariat.be/index.php?id=674,ACASeminarBrussels>
- HU, J., & CHEN, L. Z. (2017). Practice of flipping classroom teaching based on MOOC SPOC hybrid teaching. *Computer Education*, 4, 129.
- HU, Y. D., & GAO, Z. Y. (2017). Realization of computer network course flipping classroom teaching based on SPOC. *Education Informatization in China*, 2, 28.