Research on SPOC Teaching Model of University Courses in the Ubiquitous Learning Environment

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Abstract. In the ubiquitous learning environment, the integration of flipping classrooms and SPOC models can effectively promote the development of educational information and bring new vitality to college classrooms. Based on the constructivist learning theory, the article combines the flipping classroom concept with the SPOC model, designs the SPOC teaching model based on the flipping classroom, and carefully designs and deeply discusses the various stages of the course teaching. It aims to provide a useful reference for college classroom teaching design.

1. Introduction

Ubiquitous learning is a new learning method based on computational technology and situational cognition theory. It emphasizes that "learning is everywhere", "the need for learning is everywhere", and "learning resources are everywhere" [1]. In the ubiquitous learning environment, SPOC is a hybrid curriculum teaching paradigm for online and offline integration in the post-MOOC era; Its teaching mode, curriculum design, implementation path, audience scope, teaching process, and interaction methods are all very different from MOOC and traditional courses, which is more conducive to the cultivation of students' self-learning ability and collaborative innovation spirit[1,2,3]. The application, optimization and transformation of the traditional classroom teaching process using SPOC mode can not only reflect the intensive and niche-oriented online learning characteristics of SPOC, but also make the offline classroom dynamic and flexible, and also improve the quality of classroom teaching.

In order to make the SPOC model better serve the university curriculum and exert its educational value, some educational institutions and researchers at home and abroad have conducted extensive discussions and practice on the development trend, teaching process and teaching mode of SPOC. In foreign countries, Professor Armando Fox of the University of California at Berkeley optimized the "Advanced Software Engineering" course on the MOOC platform and provided it to students in the SPOC mode. Through the automatic scoring function, students can get detailed scoring results and feedback in time. In the end, the number of students in the course has increased four times compared with the past, and the evaluation of the course has reached a new high in 20 years [3]. In China, "Cloud Computing and Software Engineering" is the first pilot course of Tsinghua University to try to flip the classroom/SPOC classroom mode; students first need to watch the video of the original English course through the "School Online" platform, then discuss and interact with the knowledge points in the classroom, and complete the online submission of the homework. In addition, in the course project, a team of 4 to 6 students will showcase the latest developments of the project every other week. Through SPOC teaching, it not only increases the time for students to invest in the curriculum, but also enhances the comprehensive ability of students' independent learning, collaborative innovation, etc. It is an effective way to integrate online education with traditional education [4].

Based on a large number of literatures and analysis of many SPOC teaching cases, this paper designs a SPOC teaching model based on the flipping classroom based on the constructivist learning theory and the characteristics of the flipping classroom, and carefully designs the various stages of its classroom teaching.

2. Analysis of SPOC Teaching Mode

2.1 SPOC overview.

SPOC (Small Private Online Course) was proposed by Professor Armando Fox in 2013. Professor Fox believes that SPOC is an organic integration of MOOC and traditional campus teaching [3]. It is a new teaching model for small-scale, specific people to change the status quo of traditional higher education through MOOC resources. Its basic form is to use the MOOC video or online evaluation to assist classroom teaching in traditional campus classrooms. It can be seen that small scale, pertinence, flexibility and auxiliary are the main characteristics of SPOC distinguishing MOOC, and it is the inheritance, development and transcendence of MOOC [3, 4]. According to the learning object, SPOC can be divided into two types:

(1) For online learners: According to the set application conditions, learners of a certain size (usually around 500) from online applicants are included in the SPOC course. Enrollees must ensure a certain amount of study time and intensity of study, participate in online discussions, complete homework and exams. The passer will receive a course completion certificate [5].

(2) For college students: the essence is to use MOOC resources to carry out the hybrid teaching of the classroom. First of all, the teacher asks the students to use the MOOC resources to learn independently and complete the corresponding assignments before class; then, in the classroom teaching, through face-to-face counseling and teacher-student interaction to solve the problems encountered in the study [5, 6]. Throughout the teaching process, students receive timely and effective learning support from teachers, and teachers can set and control the progress and pace of the course according to the actual situation of the students.

2.2 SPOC classroom features.

SPOC adopts online and offline hybrid learning, which is beneficial to sharing high-quality MOOC resources, playing the characteristics of intensive and niche online learning, and making offline classrooms more dynamic, flexible and convenient. Effective SPOC classroom teaching can fully stimulate the enthusiasm, potential and interest of learners, reflecting the connectivity, ubiquity, personalization and interactivity of the teaching process [6].

2.2.1 Connectivity

SPOC is naturally social, open, and shared. Its learning subject, learning content, teaching activities, teaching resources, and teaching situations have established a series of connections with the outside world, such as online and offline connections, local and foreign connections, teacher-student connections, and student-student connections [6]. Teachers act as a medium and catalyst for communication that will guide and accelerate the integration and sharing of local and Internet courses, and let local resources be shared by society and local students integrate their learning into the Internet.

2.2.2 Ubiquity

In the ubiquitous learning environment, learners' learning methods, patterns, means, and choices in time and space are all more free [7]. SPOC's hybrid teaching format allows learners to browse learning resources, post information, participate in discussions, and share learning outcomes at anytime and anywhere. Learning will not be interrupted by time and space, and its timeliness and presence are strong.

2.2.3 Personalization

Compared with MOOC's uniform teaching, SPOC allows teachers to have more control over the classroom order. Teachers can customize heterogeneity for learners, and can be divided into levels of teaching content. The individual differences of learners are fully respected [6, 7]. The face-to-face instruction of the offline classroom allows the teacher to have more understanding and grasp of the individualized characteristics of the learner's character, intelligence, temperament, etc., so as to implement more effective teaching according to their aptitude.

2.2.4 Interactivity

Interaction plays a crucial role in learning, understanding, constructing, and migrating knowledge. The SPOC classroom provides a convenient, flexible and efficient communication space for teachers and students by building a virtual learning community and learning community. By designing highly interactive

teaching content and processes, the degree of interaction between people, people and the environment is improved, and an ecological and interactive learning situation is formed.

3. Design of SPOC Teaching Mode Based on Flipping Classroom

Flipped Classroom is a new type of teaching that "learns knowledge before class, internalizes knowledge in the classroom, and applies knowledge after class", which is very suitable for the teaching characteristics of SPOC mode. The combination of flipping classroom and SPOC mode for college classroom teaching design can effectively avoid the dependence of the compulsory and thinking process in traditional teaching, enrich the teaching methods of teachers, enhance students' knowledge throughput and class participation.

The SPOC teaching model based on the flipping classroom emphasizes student-centered learning under the guidance of teachers, which is a blended teaching through the collaborative interaction of teachers, learners, learning peers and rich online and offline learning resources. It applies self-learning, cooperative learning and inquiry learning to fully exploit the tacit knowledge of learners, thus promoting cooperation and exchange between students and the application of knowledge.

The whole teaching process is divided into three stages: course preparation, course implementation, and course evaluation. Among them, the curriculum implementation stage is the main part, which applies the flipping classroom to construct a new type of teacher-student relationship, promotes the effective use and research and development of teaching resources, reflects the advantages of hybrid learning, and is committed to creating an effective classroom trilogy: Self-learning before class, digestion and absorption in class, application and expansion after class.

3.1 Course preparation stage.

3.1.1 Course analysis

The course analysis mainly includes an analysis of the course content and learner characteristics. The content analysis of the course is based on the teaching objectives, and analyzes the scope and difficulty of the teaching content. Learner characteristics analysis includes students' grades, majors, knowledge reserves, cognitive structure, learning attitudes, learning motivation and information literacy. Through course analysis, teachers can design different teaching contents according to the different characteristics of different professional students, customize personalized learning strategies and methods for students, and improve and optimize teaching plans.

3.1.2 Course Design

The course design mainly includes knowledge unit micro video, syllabus, courseware, extended resources, test questions, projects and experiments. According to the requirements of the syllabus, teachers focus on Student learning needs as the center, Task driven as the guide, MOOC micro video as the main body to effectively integrate all kinds of online and offline teaching resources, and strive to make the Collected teaching resources high-quality and rich, the teaching content reasonable, the teaching arrangement clear.

In addition, in the SPOC teaching mode based on the flipping classroom, the application of video teaching with MOOC micro-video as the main body has far exceeded the meaning of "assisted teaching", and it has become an indispensable part of the teaching process. Therefore, teachers need to pay attention to the MOOC micro-video related to knowledge points through online collection or self-production. According to the cognitive level and psychological characteristics of college students, and following the principle of simple and practical micro-video, each micro video is about 8 to 10 minutes long, covering the introduction of knowledge points, explanations, typical examples, summary and other aspects. It allows students to systematically complete a knowledge study.

3.2 Course implementation stage.

3.2.1 Self-learning before class

Students' self-learning before class is a necessary part. For teachers, how to provide students with an autonomous learning platform with sufficient learning materials and clear knowledge structure is a key issue to be considered. First, the teacher should formulate a clear list of autonomous learning tasks according to the teaching objectives of the course unit, and prepare MOOC videos and other learning

resources that match the learning tasks on the SPOC platform. Secondly, the teacher should actively participate in the interactive discussion with the students, promptly answer questions for the students online, and make detailed statistics on the questions raised by the students, so as to timely feedback the questions to the students in the class.

For students, first of all, they should conduct online self-learning on the teaching resources published on the SPOC platform according to the teacher's tasks and requirements, and complete the classroom test; secondly, when they find problems or have doubts during the learning process, they can use online discussion forums or social media to discuss online with classmates and teachers, and make relevant records and conclusions.

3.2.2 Digestion and absorption in class

According to the four cognitive strategies of Attention, Televance, Confidence and Satisfication proposed by Professor Keller's ARCS instructional design model, classroom teaching is divided into four parts: "collaboration + interaction + testing + summary".

(1) Collaborative link: As the organizer and guide of learning, the teacher decomposes the knowledge points into several difficult tasks according to the difficulty and difficulty of the learning content. The students are divided into study groups, and 3 to 5 people are a group to accomplish these tasks through collaboration. In this way, students can increase their confidence in completing tasks and promote the smooth progress of collaborative learning.

(2) Interactive link: teachers and students conduct interactive discussions in the form of experiments, exercises and exchanges. Through interaction, we can explore the similarities and differences between new and old knowledge points, and reduce the threshold for students to accept new knowledge. Students can also have an equal and friendly interaction in a relaxed classroom atmosphere, and enhance their self-satisfaction and sense of accomplishment while the problem is solved.

(3) Test link: Students pass independent test and group report to help teachers understand the completion degree of learning objectives in time, which can be used as an important basis for follow-up instructional design.

(4) Summary link: The teacher summarizes and evaluates the test and report of the student, and answers the questions of the students one by one. Teachers supplement and explain the knowledge points that are not mentioned by students but are important. By combing and summarizing the knowledge points, students can promote the digestion and absorption of knowledge.

3.2.3 Application development after class

According to the feedback of the classroom learning situation on the day, the teacher sets a certain amount of online test questions through the SPOC platform, and arranges 3 to 6 application development practices, and conducts online counseling and answering questions, and provides some directional suggestions. Students complete and submit online tests on the SPOC platform. In addition, students need to choose and complete one or two application development practices in groups based on their own actuality through online discussions and offline collaboration, and present the final results of the practice on the SPOC platform.

3.3 Course evaluation stage

The evaluation is an important means to test students' knowledge mastery and promote effective classroom teaching. The evaluation system of SPOC mode not only reflects the diversification of evaluation subjects, but also pays attention to the diversification of evaluation methods. In order to focus on the students' learning effects and learning performance, it uses a combination of formative evaluation and summative evaluation. The proportion of formative evaluation is 50%, which mainly includes the number of landings on the SPOC teaching platform, the number of downloads of MOOC resources, the participation of online discussions, the quality of work completion, etc.; in addition, it needs to combine the following evaluation factors, such as the level of enthusiasm and performance of the offline classroom, group collaboration, student self-assessment and mutual evaluation among team members. The proportion of summative evaluation is 50%, which is mainly based on factors such as the student's test scores and completed projects. The specific situation is shown in Table 1.

Table 1 Contents, methods and proportion of evaluation in each teaching session

	Stage	Comment content	Evaluation method	Proportion
Formative evaluation	Before class	Online learning record	Teacher evaluation, SPOC platform automatic evaluation	15%
	In class	Engagement, Collaboration, Test scores ,reporting results ……	Teacher evaluation, Team member mutual evaluation	25%
	After class	Practice results, Online test scores, Collaboration	Teacher evaluation, SPOC platform automatic evaluation	10%
Summative evaluation	Mid-term	Mid-term test score	Teacher evaluation	20%
	Final-term	Final-term test score		30%

4. Conclusion

In summary, in the ubiquitous learning environment, teaching has methods and teaching has no fixed method. For the teacher group, we should seize the opportunity to actively carry out specific research and curriculum practices on the SPOC teaching model, and strive to transform ourselves from the instructors and indoctors of knowledge to the instructors and facilitators of learning. Let students change from the passive recipients and the instilled objects of knowledge to the initiative of learning construction, and truly become the master of learning.

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