

Exploration of SPOC Teaching Mode Based on "Superstar Learning APP+BOPPPS Model"

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Abstract: In order to promote the application of online and offline mixed teaching mode in the teaching of chemical principle courses and effectively improve the teaching quality of courses, this paper makes a practical exploration of SPOC teaching mode based on "Superstar Learning APP+BOPPPS model". Taking the teaching process of "Basic Equations of fluid Mechanics" as an example, this paper discusses the construction and application effect of SPOC teaching mode in the teaching design of chemical principles classroom. The results show that the SPOC teaching mode can greatly stimulate student learning enthusiasm, significantly increase student classroom participation, and contribute to the achievement of curriculum teaching objectives. Under the background of more and more attention to online and offline mixed teaching mode in college teaching, SPOC teaching mode based on "Superstar Learning APP+BOPPPS model" is a novel attempt to the informatization teaching of chemical principle courses, and has certain reference for other courses.

Keywords: Principles of chemical engineering; BOPPPS; Superstar Learning APP; SPOC

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Principle of chemical engineering is the basic course of engineering technology and the core course of chemical engineering and technology major. Driven by the "Internet+" era, classroom teaching of principle of chemical engineering is facing opportunities and challenges brought by informatization. In traditional teaching, teachers' unilateral output is difficult to improve students' innovative and deep learning ability. In order to improve the teaching quality of principle of chemical engineering, fully grasp the dividend of the "Internet+" era, and effectively use online education resources, it is necessary to carry out online and offline blended teaching to change the teaching structure of principle of chemical engineering. This kind of teaching structure reform cannot be separated from the support of technology platform. In this study, the online teaching of principle of chemical engineering adopts the teaching platform of Chaoxing Learning. SPOC is a kind of teaching organization form that integrates network learning with traditional teaching, and has become an important practice way of classroom teaching innovation in colleges and universities. In this paper, SPOC is designed and implemented for the fluid dynamics teaching of principle of chemical engineering, hoping to solve the bottleneck problem existing in the traditional classroom teaching of principle of chemical engineering, and improve students' autonomous learning ability while participating in classroom teaching.

1. Research Status of SPOC Teaching

1.1 The concept of SPOC

In 2013, Professor Armando Fox of the University of California in the USA first proposed the concept of SPOC, whose full English name is Small Private Online Course. He believes that SPOC is an organic integration of MOOC and traditional classroom teaching. It is a solution to change the status quo of traditional higher education by using MOOC resources for a small group of specific people. Professor Yeqin Kang of Tsinghua University translated SPOC as "small-scale restricted online courses", Qi Zhang et al

translated SPOC as small-scale non-public online courses, and Yonglin Yang et al called SPOC “small micro courses”.

1.2 The teaching mode in SPOC environment

Domestic scholars conducted in-depth discussions on how to integrate SPOC with classroom of entities. The research Topics include the SPOC teaching model of flipped classroom, the SPOC teaching model of blended learning, and the innovative research on the SPOC teaching process.

There are many practical case studies on the SPOC teaching model of flipped classroom. For example, Yeqin Kang constructed the basic process of the SPOC teaching model of flipped classroom by classifying and summarizing the teaching objects. Pengjiao Wang et al. believe that SPOC is characterized by changing and reshaping the teaching effect, using high-quality online teaching resources, SPOC teaching design and flipped classroom concept as guidance basis, and studying the role of SPOC in promoting the development of open education. The key point of the design of SPOC teaching model is to maximize the value of SPOC to education, so how to perfectly integrate SPOC with classroom of entities has become the core issue of the process. Ran Chen et al. designed the blended learning model of SPOC under the guidance of the design principles of initiative, sociality and systematicness. In the exploration and practice of blended teaching based on MOOC+SPOC, Xiaohong Su, Lingling Zhao et al. analyzed the practical ways to integrate online resources with traditional teaching, and realized the blended teaching, which combines online and offline, and complements each other inside and outside the classroom.

With the in-depth study of SPOC teaching model, scholars at home and abroad began to pay attention to the innovation of SPOC teaching process. Effectiveness is the core pursuit of teaching practice. In order to maximize the value of each teaching mode, it is necessary to organically integrate mature classroom teaching mode with SPOC in order to give full play to the advantages of effective SPOC teaching. BOPPPS is a clear and efficient teaching mode. The author integrates BOPPPS with SPOC in order to improve the quality of classroom teaching of principle of chemical engineering.

2. SPOC Teaching Design

2.1 About the teaching activities

Teaching activities generally refer to all activities carried out according to the teaching plan, which is composed of two sides: teaching and learning. Teachers play a leading role in teaching activities, and students are the main body of teaching activities. The research results of Qunli Sheng et al. showed that the more learners participate in the activity, the more their learning ability can be enhanced. The design of teaching activities should be conducive to teachers' teaching, conducive to students' learning, and maximize the potential of teaching environment (technology platform). This paper takes Chaoxing Learning platform as the online learning environment, carries out offline teaching with the BOPPPS teaching model, and designs SPOC teaching activities based on the blended environment of online and offline. The forms of activities can be eclectic. The teaching activity design under the BOPPPS teaching mode provides us with more scientific theoretical guidance for the integration of online and classroom teaching activities. Xiaoxiao Yuan integrated the BOPPPS teaching mode with SPOC and designed the teaching activity under the SPOC environment. Under the guidance of mature BOPPPS teaching mode, this paper aims to construct SPOC blended environment of the teaching of chemical engineering principle and complete the design of blended teaching activities of chemical engineering principle.

2.2 Instructional Activity Design

With the help of the “Chaoxing Learning platform” and the development of campus information technology, Mingjue Zhang et al. realized the SPOC teaching model of “learning knowledge outside class, internalizing knowledge in class, integrating teaching and discussion, and complementing classroom and network” in the teaching of principle of chemical engineering. On the basis of this research, the author takes BOPPPS as the guiding principle to carry out the design of the teaching activities of chemical engineering principle.

The six links of BOPPPS teaching model include introduction, goal, pre-assessment, participatory learning, post-assessment and summary. SPOC is divided into two parts: Chaoxing learning platform and classroom teaching environment. Through the research of BOPPPS teaching mode and SPOC, the BOPPPS goal and pre-test are arranged to be carried out on the Chaoxing Learning platform. The two links complement each other. The goal is the basis of pre-test design, and the pre-test is the embodiment of the goal. The process of participatory learning needs to be introduced as a foundation, the test of the process of participatory learning is undertaken by the post-test, and the summary can enable students to deeply digest the teaching content and strengthen knowledge absorption. Therefore, these four links are arranged in the classroom environment, and each teaching link is designed to match the environmental conditions and requirements.

3. SPOC Teaching Practice of Principle of Chemical Engineering

3.1 Teaching activities in Chaoxing learning platform

After deeply analyzing the graduation requirements supported by professional training programs and courses, teachers should comprehensively consider the three factors of students, teaching content and teaching environment before formulating teaching objectives. Objectives should be clearly hierarchical. According to Bloom's classification of educational objectives, the learning objectives to be achieved in this section include identification, definition, restatement, description, explanation, and application. Teaching objectives should be uploaded to Chaoxing Learning platform at least 48 hours before class, and highlighted in the teaching video to require students to clarify the learning requirements and key difficulties according to the teaching objectives, send study notices and study requirements to students and remind them to study in time. The teacher can check whether the students check the notice in time through the teacher side, and judge whether the students grasp the objectives through the questions in the video learning.

Teaching objectives for hydrodynamic equation:

(1) Be able to define and restate the flow rate and velocity of fluids, identify steady-state and unsteady flows, and define the viscosity and stickiness of fluids; (Achieved on Chaoxing Learning Platform)

(2) Be able to describe and explain Newton's Law of viscous fluid, the continuity equation, Bernoulli's equation; (Achieved on Chaoxing Learning Platform)

(3) Be able to use the continuity equation and Bernoulli's equation to calculate operational and design problems in fluid flow. (Achieved in offline classroom)

3.2 Pre-assessment

Pre-assessment is to allow students to reflect the problems or doubts in the learning process through various forms, and accurately locate the starting point of teaching. The pre-assessment of this section is completed by two contents: assigning homework and publishing discussion topics. After learning the online video, homework should be submitted as required. For the teaching goal achieved online, it is appropriate to use short answer questions, and it is necessary to explain the homework requirements and precautions. What is the continuity equation? What is the viscosity of a fluid? What are the characteristics of steady and unsteady flow? The teacher judges the student's learning in Chaoxing learning platform through the quality of homework completion. The purpose of the discussion session is to find the problems existing in students. Teachers design discussion activities and conduct pre-assessment based on the discussion content of learners to find the problems of learners. The discussion topic published can be a discussion on video content, a discussion on issues related to homework, or a discussion on related cases in life. Teachers should pay attention to and guide the direction of the discussion topic, and affirm the good discussion topic to avoid the discussion content deviating from the theme.

3.3 Offline teaching activities

Teachers can ask students to sort out and display the problems in video learning, which is called import of problems. The teacher asked questions about the online learning situation, and aroused the students' attention to recall and think about the online learning content and learning situation. For example, what is the most frequently discussed topic? Are the content and answers discussed by students, correct? Through the analysis of online discussion topics, teachers sort out the discussion content according to the frequency, and then summarize the knowledge points of the study through the import of questions, and then carry out the practical teaching of the basic equations of fluid dynamics.

Participatory learning can perfectly explain what is "teacher-led, student-centered". The key to improve teaching quality is to enhance students' classroom participation. The participatory learning process can be teacher-led inspired teaching, student-centered discussion teaching, or flipped classroom. At this stage, in order to fully mobilize the enthusiasm and initiative of students, teachers must flexibly use teaching methods. Participative learning is mainly based on heuristic teaching, supplemented by discussion, task-driven and engineering cases to guide students to actively participate in teaching activities such as thinking and expression. Three participative learning links are designed in this lesson.

(1) Teachers organize students to discuss the significance of the Bernoulli's equation. (Discussion group teaching is adopted here, where each group should choose representatives to state the conclusions drawn from the discussion, guide students to analyze the rationality of the conclusions, and finally display the correct conclusions.)

(2) Teachers provide images of airplanes flying in the air, ships sailing in water, and siphoning phenomena through PowerPoint to guide students to use Bernoulli's equation to analyze and understand the application of Bernoulli's equation in daily life through interactive inspiration process. (Heuristic teaching is used here)

(3) Teachers guide students to think about which aspects of engineering problems can be solved by the Bernoulli's equation, then provide examples and explain the exercises separately. (The explanation process should follow the approach of setting questions, asking questions, and summarizing.)

3.4 Post-assessment

The purpose of post-assessment is to verify whether the participatory learning process mentioned above has achieved the teaching objectives. Teachers can use problem summary and group reporting to carry out the post-assessment.

Classic question 1: How to avoid suction accidents during sea navigation?

Classic question 2: Why wait outside the yellow line in the stands?

Classic question 3: Let us review the learning process of basic equations of fluid flow, what problems have been encountered? What have you gained?

The team leader organizes group members to analyze, discuss, and organize speech outlines on the above issues. A student is selected to complete the problem report. After comparison between groups, students' reflective and critical thinking abilities can be improved.

3.5 Summary

Teachers summarize the teaching process by guiding students to recall classroom content and organize key knowledge points. Teachers can use mind maps or classroom blackboards to review classroom knowledge. The teaching summary of this lesson is completed using mind maps.

4. Conclusion

In this paper, the mature offline teaching mode of BOPPPS is organically integrated with the online teaching environment, and it is explored that the SPOC teaching practice in the blended environment. After the practice research of two cycles of instruction, it is found that the SPOC teaching mode of "Learning Platform+BOPPPS" can effectively solve the problem of low participation. In SPOC teaching, whether it is online discussion or offline discussion report, both teachers and students have a better experience, and the most important thing is to improve the achievement of teaching goals. Therefore, the SPOC teaching mode of "Learning Platform+BOPPPS" is an effective teaching mode for the informatization of teaching of chemical engineering principle in the era of "Internet+".

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