

Exploration and Practice of Blended Teaching Mode Based on “SPOC + Smart Classroom”— Taking “Information Security Protection in the Mobile Internet Era” as an Example

Naying Gou, Guangya Zhang*, Guowang Jin, Xiang Xu, Zhujun Qing

Education Information Center, Guangdong Ocean University, Zhanjiang, China

*Corresponding author

Abstract: This paper introduces an innovative hybrid teaching mode that integrates the smart classroom environment and SPOC platform. This mode aims to transform traditional one-way teaching and enable multi-directional ability training. By exploring the integration of the smart classroom environment and SPOC, it assists teachers in developing their teaching strategies and effectively utilizing the smart classroom environment to support teaching and learning activities. Moreover, it aims to enhance the overall impact of classroom teaching and provide practical examples for frontline teachers to implement in smart classroom environments.

Keywords: SPOC; smart classroom; blended teaching

1. Background and explanation of the problem

The education informatization and the digital transformation of colleges and universities have brought about changes in teaching methods and learning forms. In the past two years, under the background of the digital transformation of colleges and universities and the impact of the COVID-19 epidemic, the concepts of MOOC, SPOC and flipped classroom have once again become the object of heated discussion in the education field, and their practice in the classroom of colleges and universities is also increasing. In order to promote smart teaching and promote the reform of classroom teaching in schools, many colleges and universities have built smart classrooms. The author found that in the process of using smart classrooms, many teachers just moved the traditional classroom to the smart classroom, and the teaching mode used is still the traditional teaching-oriented teaching mode where the teacher talks and the students listen. This mode can not truly play the role of smart classrooms, nor can it effectively cultivate students' innovation ability and practical ability, which runs counter to the concept of education informatization. Therefore, in view of the above problems, under the background of digital transformation and classroom teaching reform in universities, to meet the national needs for the construction and development of information teaching in universities, the author draws on the experience of information resources construction of network teaching platforms at home and abroad, and preliminarily explores the construction of SPOC blended teaching for general education elective courses in our university. The author plans to build a blended teaching mode based on "SPOC + smart classroom", so as to help teachers develop teaching thinking, effectively play the supporting role of smart classroom environment for teaching and learning activities, further strengthen the classroom teaching effect, and provide reference for front-line teachers to implement classroom teaching in smart classroom environment.

2. Exploration and Practice of the Hybrid Teaching Model of "SPOC + Smart Classroom"

2.1 The Connection between SPOC and Smart Classroom

The hybrid teaching mode based on "SPOC+Smart Classroom" provides a conducive environment for interactive instruction and immediate feedback^[1]. During actual teaching sessions, teachers can create diverse instructional scenarios tailored to different content areas, explore various pedagogical approaches, deepen the integration between educational technology and traditional classrooms, thereby elevating the quality of education.

2.2 The Construction Strategy of a Hybrid Teaching Model of "SPOC + Smart Classroom"

The blended teaching model, based on "SPOC + Smart Classroom," distinguishes itself from traditional teaching models that solely emphasize the classroom teaching process. The SPOC blended teaching model for smart classrooms places emphasis on integrated instructional design before, during, and after class^[2]. By incorporating relevant theoretical foundations and drawing upon the research achievements of scholars in the field, a university-level blended teaching model has been developed (refer to Figure1). This model is primarily divided into three phases: pre-class - resource integration and task release; in-class - online self-learning and offline communication; post-class - pedagogical reflection and effectiveness evaluation.

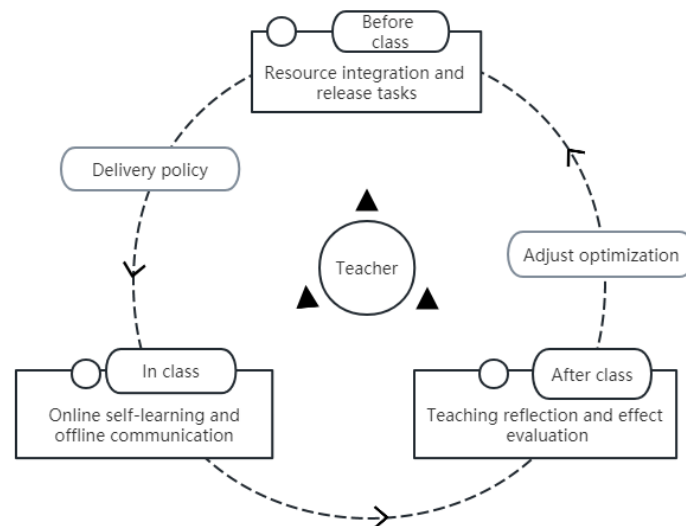


Figure 1 University hybrid teaching mode based on SPOC + Smart classroom

Pre class: In the pre-class stage of the blended teaching mode based on 'SPOC + Smart Classroom,' teachers strategically integrate learning resources based on students' specific needs, combining selected SPOC courses with offline content recorded in the smart classroom. This process involves reconstructing knowledge modules that align with the course's teaching objectives, selecting exemplary cases, creating comprehensive course resource packages, designing engaging learning tasks for the instructional content, and subsequently publishing them online.

In class: Online instructors proactively provide learning materials based on classroom teaching and learning tasks. Students have the flexibility to access the SPOC platform within designated timeframes for autonomous acquisition of fundamental knowledge, while also collaborating in learning groups to accomplish shared objectives. Offline activities are facilitated by smart classrooms, catering to teacher-student interactions. An online assisted teaching system enables comprehensive teaching interactions, encompassing check-ins, in-class assessments, grading, note sharing, peer evaluations, etc., primarily conducted within smart classrooms^[3]. Students are divided into groups for effective communication and discussion using smart classroom equipment; activities such as screen projection and file sharing further enhance integration of diverse teaching approaches and methods to enrich content delivery, foster interaction dynamics, and invigorate the classroom ambiance^[4].

After class: Upon completion of the learning content for each chapter, teachers can access the recording system of the smart classroom and utilize the recording platform to review teaching videos, thereby reinforcing the effectiveness of their instruction. Furthermore, teachers can engage in post-class video analysis to carefully contemplate and reflect upon their teaching methods. The automated evaluation feature offered by SPOC relieves teachers from intricate and repetitive tasks, enabling them to concentrate on high-value teaching and research endeavors such as conducting profound discussions with students within a smart classroom setting or addressing more complex problems^[5]. Based on automatically generated grades in the SPOC backend, duration of students' online learning sessions, as well as records documenting student reporting and communication within the smart classroom environment, teachers can conduct targeted analysis and management tailored to different types of students while also providing timely supervision over their learning progress. Additionally, at the conclusion of each semester's courses, personal interviews and survey questionnaires are conducted to gauge students' opinions and sentiments regarding the blended teaching mode incorporating 'SPOC +

Smart Classroom,' thus forming a comprehensive and objective assessment of this instructional approach. In response to any issues arising during teaching practice, revisions are made to enhance and optimize both the overall teaching process and content.

2.3 The Practice and Evaluation of Teaching Effectiveness of the "SPOC+Smart Classroom" Mixed Teaching Model

The specific implementation time of this case has been three semesters so far, with one semester being one cycle and 632 teaching objects implemented during the three semesters. The specific implementation process is as follows:

Teaching preparation: After full demand analysis, we chose the "Information Security Protection in the Mobile The Internet Age" as the SPOC course, which was taught by Chen Bo of Nanjing Normal University on the Superstar platform. In addition, teachers also need to prepare corresponding internet learning resources for students to meet their personalized learning needs.

Teaching implementation: During the teaching process, online teachers release the learning content of SPOC courses to students, assign learning tasks, set questions, and let students learn independently through the Guangdong Ocean University online teaching platform (Superstar) or Learning Connect APP, participate in E-learning discussions, upload assignments, and make E-learning notes. Teachers log in to the platform to check students' learning progress, timely supervise students who have not participated in learning, and do a good job in teaching management. After completing each stage of learning tasks, students participate in online learning assessments, and teachers organize offline courses. Offline teachers explain key learning contents in the smart classroom, answer questions for students, organize students to complete offline group Collaborative learning, report learning results, etc., so as to promote the improvement of learning quality. The smart classroom is equipped with multi-screen interaction, integrated computers, projectors, wireless network support, and tables and chairs that can be moved freely. In offline classrooms, teachers can use the smart classroom management tools in the smart classroom to intelligently and conveniently teach and manage the classroom. There are also eight student smart teaching integrated machines in the smart classroom, which facilitates group collaboration activities. At the end of each semester, the offline classroom records generated by the smart classroom can serve as teaching resources for the next semester. Teachers can organize some student reports, exchange and discuss exciting moments, and provide them for students to observe and learn in the next semester.

Teaching evaluation: evaluate students' learning effect and teachers' teaching effect after teaching, including peer evaluation, learning situation of online learning platform and Big data analysis of SPOC platform. Student evaluation and online learning platform evaluation are conducted after each course, and SPOC platform Big data analysis is evaluated after the completion of the entire learning goal. The final academic performance of students is composed of E-learning performance (70%)+offline learning performance (30). The online performance is composed of teaching videos, chapter tests, assignments and online Final examination on the course teaching platform. Offline grades consist of process learning performance such as offline classroom attendance, classroom performance, offline assignments, and work reports.

Effect analysis: After the end of each semester's course, four methods are used to analyze and evaluate the effectiveness of teaching implementation. One is the data of learning process: analyze the data generated by students' online learning and the data generated by offline group Collaborative learning; The second is a questionnaire survey: after the end of each semester, students who participate in teaching will be distributed a "SPOC+Smart Classroom" hybrid teaching mode application effect questionnaire "; Thirdly, interview method: Develop an interview outline based on the "SPOC+Smart Classroom" blended teaching mode to understand students' learning experiences, opinions, gains, and suggestions for the "SPOC+Smart Classroom" blended teaching mode. Interview teachers to understand the actual teaching implementation situation, understand the application situation and effectiveness of the teaching mode; The fourth is the analysis of teaching videos, analyzing the teaching videos of smart classrooms every semester.

By organizing and analyzing learning process data, questionnaire interview data, teaching videos, and three semesters of online and offline learning situation data. As shown in Table 1, we found that students have a higher acceptance of the "SPOC+Smart Classroom" blended teaching mode and prefer this teaching mode (as shown in Table 1). In addition, as shown in Table 2 and Figure 2, students' academic performance in each semester also shows a gradual improvement trend.

Table 1: Student Part Comments

Evaluation Object	teacher	Opening College	Education Information Center	Course Name	Information Security and Protection in the Mobile (The Internet Age)
Comment					
Student1	The teacher's teaching style is natural, with a friendly tone, and constantly encourages students to fully play their role as the main body. By enabling students to learn in a harmonious and integrated classroom atmosphere, it promotes the mastery of knowledge and the development of intelligence, and achieves good teaching results.				
Student2	The teacher has good teaching effectiveness in organizing classes, clear language, can guide students with main learning methods, cultivate students' innovative abilities, and inspire problem design.				
Student3	The teacher's teaching has enabled me to master relevant knowledge and technology, enhancing my application ability				
Student4	On the basis of simple written knowledge, teacher teaching further expands the depth and breadth of teaching knowledge, expands students' knowledge range, and cultivates students' ability to think about problems in various aspects. As a result, teacher's knowledge is profound, and teaching is also expanded in book knowledge. In class, teachers pay great attention to the interaction with students, which enhances the classroom atmosphere and makes the teaching effect more significant.				
Student5	Teachers pay attention to teaching students according to their aptitude and promote their individual development; Teachers are good at regulating the classroom teaching atmosphere, emphasizing teacher-student interaction, and encouraging classmates to speak. The teacher's teaching content is rich and colorful, and the goals are clear. They are good at using a combination of point and face methods to teach, which has a certain enlightening effect on my future learning and life.				
Student6	The teacher's teaching has inspired my thinking and improved my problem-solving ability and innovative awareness				
Student7	Teachers can choose appropriate teaching methods and means based on the characteristics of the course, implement heuristic teaching, and achieve individualized teaching and accurate expression.				
Student8	Through unique and in-depth explanations of textbooks, teachers have achieved good teaching results and can combine various teaching methods to deepen students' mastery of knowledge. The focus of the teaching content is prominent, and the teaching purpose is very clear.				
Student9	The teacher achieved good teaching results through unique and in-depth explanations of books, with a deep knowledge system and the ability to combine various teaching methods, making our mastery of knowledge more profound. The teaching content highlights the key points, the teaching purpose is very clear, the language is fluent, easy to understand, and the idea is novel, which can attract our attention during class and have more interaction with us, stimulate our thinking and learning interest.				

Table 2: Comprehensive Statistics of Course Scores

Class	Maximum score	Minimum score	Average score	Standard deviation	Variance	Pass rate	Excellent rate
w521910001-01	98	0.00	81.63	12.75	162.54	93.14%	71.33%
w521910001-02	98	5.51	88.75	11.25	126.65	95.10%	79.43%
w521910001-03	99	16.91	91.58	10.86	117.96	95.70%	82.92%

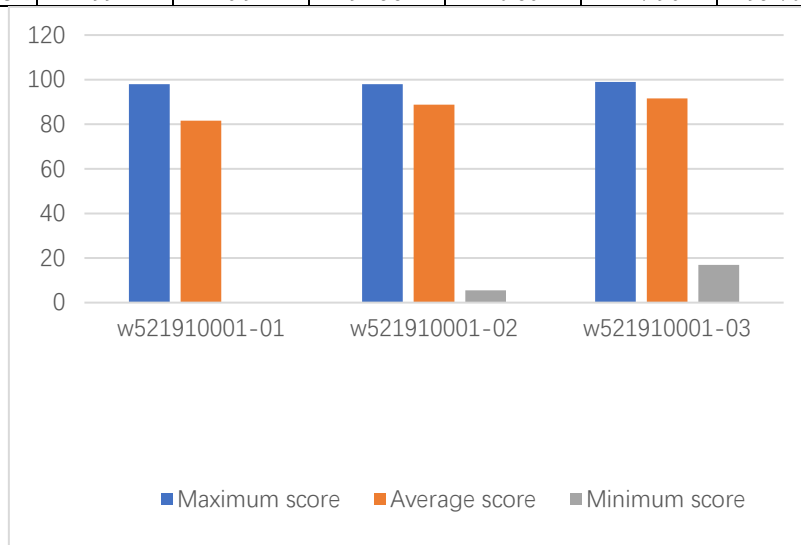


Figure 2: Comprehensive Comparison of Course Scores

3. Analysis of Factors Influencing the Practice of the "SPOC + Smart Classroom" Hybrid Teaching Model

3.1 Student collaboration ability

Due to individual variations and disparities in students' abilities, certain groups may encounter challenges such as lack of coordination, insufficient communication, and unclear task responsibilities during collaborative assignments. Moreover, the difficulty level of tasks can differ across various assignments. Consequently, when students divide their workload, divergent opinions may arise easily and coordination becomes arduous. These factors can lead to the development of negative learning emotions among students and subsequently impact teaching progress as well as hinder students' learning enthusiasm^[6].

3.2 Teacher's teaching skills

Although adopting SPOC+smart classroom hybrid teaching, teachers spend less time on teaching, but have higher requirements for teachers. Teachers need to adjust their teaching based on students' learning situations, and also need to spend more time and energy organizing offline teaching. They need to have strong teaching design skills, comprehensively analyze factors such as students, teaching content, teaching activities, and teaching environment. Teachers need to integrate online and offline organically, and provide timely guidance to students. However, due to the limited energy and abilities of teachers, more detailed and in-depth guidance is needed for certain groups, which requires higher knowledge and abilities of teachers and requires continuous self-learning and improvement.

4. Conclusion and inspiration

This case combines SPOC with smart classrooms to construct a hybrid teaching mode based on SPOC+smart classrooms. Practice has shown that compared to traditional teaching modes, adopting SPOC+smart classroom hybrid teaching mode can effectively improve students' self-learning ability, and teachers' information based teaching level and quality can also be gradually improved. Through information based teaching methods, high-quality teaching resources can be generated. It can also improve the utilization rate of teaching resources. In the process of using the blended teaching mode of SPOC+smart classroom, the following issues should be noted:

4.1 Creating a Good Online and Offline Teaching Environment

Firstly, actively create an SPOC teaching environment. University educators should change their traditional teaching concepts and actively introduce task based teaching models such as SPOC. In teaching activities, it is necessary to pay attention to students' personalized learning needs, so that students of different levels can engage in differentiated learning^[7]. At the same time, educators should also possess good and intelligent literacy, guide students to change their learning methods, and transform the learning style mainly based on "learning from scratch" into a learning style mainly based on "self-learning"^[8]. The teaching mode based on SPOC+smart classroom needs to integrate online and offline teaching resources, and the teaching implementation should have a better multimedia environment^[9]. Therefore, the school should actively build smart classrooms, and teachers and students need to have good information literacy.

4.2 Enhancing Teachers' Informatization Teaching Ability

Based on the "SPOC+Smart Classroom" teaching mode, teachers should have basic information literacy, be able to master computer network technology, and be extremely familiar with the whole process of online online learning^[10]. Therefore, teachers need to constantly improve their information Technological literacy and classroom control ability, and constantly enrich and improve themselves. Teachers need to dynamically monitor students' learning progress. There should be different teaching plans and objectives before, during, and after teaching. Before teaching, a deep needs analysis needs to be conducted. During teaching, teachers need to guide and integrate tasks throughout. After teaching, they need to grade through SPOC, and at the same time, use online platforms to view the effectiveness of students' autonomous learning, and conduct teaching reflection to deeply reflect on the shortcomings in teaching.

Acknowledgments

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