

Reform and Practice of Blended Teaching for “Preventive Medicine” Course Based on the “SPOC+BOPPPS” Model under the OBE Concept

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Abstract: Objective: To evaluate the effectiveness of blended teaching for the “preventive medicine” course based on the “SPOC+BOPPPS” model under the OBE concept. Methods: A questionnaire survey was used to evaluate students' satisfaction with blended teaching, scores of various examinations and comprehensive ability. The two-sample independent rank sum test was used to evaluate whether there were differences in scores of various tasks and various abilities among students of different majors. Results: More than 90% of students are satisfied with this teaching reform, with a median overall rating of 10 points for the course. Students have high scores in formative and summative assessments, with median scores exceeding 80 points. Students' comprehensive abilities are generally excellent, with a median score of 4 for all abilities. Conclusion: Under the concept of OBE, the student's satisfaction with the “SPOC+BOPPPS” model applied to the blended teaching of preventive medicine is higher, and the overall teaching effect is good.

Keywords: Blended Teaching; OBE; SPOC; BOPPPS.

1. Introduction

In recent years, to promote the in-depth reform of education and teaching, the Ministry of Education has formulated and issued a series of policies and documents. For example, to improve the quality of curriculum teaching, the Ministry of Education issued relevant documents in 2018 to create "golden courses" and eliminate "watercourses", encouraging universities to build several online golden courses and Blended courses that combine online and offline teaching methods. Reasonably and efficiently utilizing current information technology to serve education and teaching has become one of the key directions of university teaching reform. On this basis, the results-oriented, student-centred, and continuous improvement teaching philosophy has gradually penetrated the teaching work of various majors, becoming an important direction for the teaching reform of universities in China.

Preventive medicine is an important compulsory course in the School of Health and Medical Technology at Chengdu Neusoft University. Medical students need to possess basic knowledge and corresponding professional skills in preventive medicine in modern medical practice. However, in actual teaching, since the current curriculum of this course is entirely theoretical, students do not attach enough importance to preventive medicine and have not fully mastered the basic knowledge and skills required by this course. In the future, students may rarely be able to apply the preventive medicine knowledge and skills they have learned to medical practice in their work. To address the shortcomings of traditional teaching, this project plans to carry out blended learning reform for the "Preventive Medicine" course based on the "SPOC+BOPPPS" model, guided by the outcome-based education (OBE) [1] concept, following the educational positioning and professional characteristics of Chengdu

Neusoft University.

Outcome-Based Education (OBE) is a student-centered, results-oriented and continuous improvement teaching philosophy, which attaches importance to the integration of students' knowledge, skills and attitudes, and pays attention to the cultivation of students' comprehensive ability. Small Private Online Course (SPOC) [2] is a blended teaching model that applies massive open online courses (MOOC) teaching resources (video resources, teaching materials, question banks, discussions, etc.) to a small-scale teaching environment. The emergence of SPOC comes from the proposal of MOOC related concepts in 2008 [3]. MOOC teaching is not limited by time and place, but to a certain extent, reduces the realistic communication between teachers and students³. To better realize education informatization, it is necessary to combine the advantages of MOOCs and traditional classrooms effectively. Professor Armando Fox of the University of California, Berkeley innovatively proposed the small private online course (SPOC) in 2014 [4]. It integrates network teaching resources and realizes the organic combination of online and offline teaching. Since then, SPOC has been introduced in China and applied to the teaching practice of various majors.

The BOPPPS teaching model was first proposed by Douglas Kerr of the University of British Columbia (UBC) in 1978 [5]. BOPPPS teaching mode includes the introduction of “B” (Bridge-in), “O” (Objective), “P” (Pre-assessment), “P” (Participatory learning), “P” (Post assessment) and “S” (Summary) [6]. With constructivism and a communicative approach as the theoretical basis, it emphasizes a student-centred teaching process and effectively improves students' participation in classroom teaching [7]. Because of its simplicity and easy operation, BOPPPS teaching mode has been widely used in various skills training in Canada and many countries around the world. Later, it was introduced into

China and applied to various teaching practices.⁷ Because of its good learning effect and the realization of the OBE teaching concept, it is one of the most popular teaching modes at present [8].

So far, under the concept of OBE, many teachers carry out teaching practice based on the SPOC teaching mode or BOPPPS teaching mode, but few teachers combine the teaching mode of SPOC and BOPPPS to teaching practice. In the Chinese Mainland, only a few teachers will combine these two teaching modes and apply them to the teaching practice of medical courses. Only Luo Jun [9] of Qilu Medical University and Li Juan [10] of Lanzhou University have applied this teaching mode to the theoretical teaching of medical immunology and the experimental teaching of pathophysiology. No teaching practice of this method in preventive medicine courses has been found. Therefore, under the guidance of the concept of OBE, this study innovatively applied the "SPOC+BOPPPS" model to the mixed teaching reform of preventive medicine curriculum, aiming to explore its effect on teaching practice. This study optimizes teaching content based on student's actual needs and adopts a blended teaching method based on the OBE concept to teach students. The Chaoxing platform was used to record students' attendance, online learning status, completion of pre-class tests, completion of homework, completion of group tasks, participation in post-class discussions, and completion of mid-term exams and anonymous surveys online.

2. Methods

2.1. Study Participants

The participants of this study are undergraduates at Chengdu Neusoft University. A total of 120 students are included in this study, among which 48 are majoring in health service and management and 72 are in medical imaging technology.

2.2. Research Method

Literature search: Literature resources on blended teaching based on the "SPOC+BOPPPS" model under the OBE concept were searched from CNKI, Wanfang, VIP and Pubmed database, to understand the domestic and foreign research status and application trend of the OBE concept, "SPOC" teaching model and "BOPPPS" teaching model applied to teaching practice.

Questionnaire survey: An anonymous questionnaire survey was used to obtain students' satisfaction with the course content, teaching form, teaching resources and teachers' teaching level. Obtain the student's overall rating for the course; The comprehensive ability scale was used to evaluate the scores of students' various abilities.

Data analysis: Since the continuous data in this study were all non-normal distributions, we used the quartile to describe the continuous data and the composition ratio to describe the categorical variable. The two-sample independent rank sum test was used to evaluate whether there were differences in scores of various tasks and scores of various abilities among students of different majors. $P < 0.05$ was considered statistically significant, all analyses were performed using Excel and Stata software, version 17.

3. Results

3.1. Student Satisfaction with Blended Learning

As shown in Figure 1, the results of the questionnaire survey show that 90% of the students are satisfied with the content of the course, 90.8% of the students are satisfied with the teaching form of the teacher, 90% of the students are satisfied with the online resources provided by the teacher, 90.8% of the students are satisfied with the teaching level of the teacher, and the overall satisfaction is high.

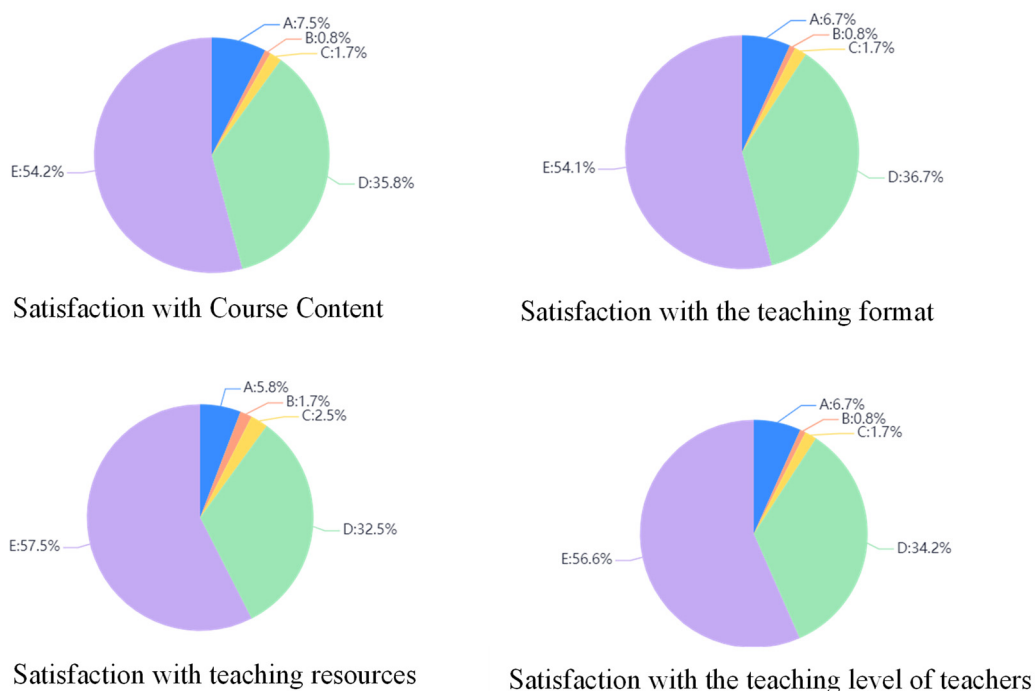


Figure 1. Students' satisfaction with blended teaching practice.

Note: A, very dissatisfied; B, dissatisfied; C, generally; D, satisfied; E, very satisfied

3.2. The Completion Status of Various Online Tasks in Blended Learning

The online tasks of this teaching reform include attendance, video learning, pre-class testing, after-class discussion, homework and group tasks. All students enrolled in this course completed the task of online learning, and all students scored 100 points in this part. The completion of after-class discussions was poor, the completion quality of group tasks was general, and the completion of pre-class tests and

homework was good. Students majoring in health services and management scored higher on attendance, pre-class tests, after-class discussions, after-class assignments, and group tasks than students majoring in medical imaging technology. The completion of online tasks of students majoring in health service and management was generally better than that of students majoring in medical imaging technology, and the difference between the two groups was statistically significant ($P < 0.001$) (Table 1).

Table 1. Scores of various tasks in blended teaching

Group	Attendance	Video learning	Pre-class testing	After-class discussion	Homework	Group tasks
Health services and management	100 (100,100)	100 (100,100)	100 (75,100)	46.5 (34.5,81)	96 (93.5,99)	75 (70,75)
Medical imaging technology	100 (87.6,100)	100 (100,100)	75 (62.5,100)	30 (3,35)	91 (82, 97)	80 (75,85)
Z value	3.619	1.160	4.388	4.812	3.313	-3.695
P value	<0.001	0.246	<0.001	<0.001	<0.001	<0.001

3.3. The Score of Formative Evaluation, Final Evaluation and Course Evaluation of Blended Teaching

Students majoring in health services and administration had higher scores in the formative and final evaluation than those majoring in medical imaging technology, and the difference between the two groups was statistically significant ($P < 0.001$). However, in terms of course evaluation, the median score of the students in both majors was 10 points, and the difference was not statistically significant ($P=0.742$) (Table 2).

Table 2. The scores of formative evaluation, final evaluation and course evaluation after blended teaching reform

Group	Formative evaluation	Final evaluation	Course evaluation
Health services and management	87.6 (85.4,89.5)	86 (83.5,88)	10 (9,10)
Medical imaging technology	80.7 (74.7,85.9)	81.5 (73,85)	10 (9,10)
Z value	5.719	5.011	0.330
P value	<0.001	<0.001	0.742

3.4. Test Scores of Students After Blended Teaching Reform

The median score of the mid-term exam of the students was

less than 60 points, and there was no statistical difference between the scores of the students of the two majors ($P=0.101$). However, after one semester of teaching practice, the scores of the students majoring in health service and management were higher than those majoring in medical imaging technology ($P < 0.001$) (Table 3).

Table 3. The score of students' exams after the reform of blended learning

Group	Mid-term exam	Final exam	Z value	P value
Health services and management	57.6 (42.5,63.7)	84.3 (81,88.3)	-8.290	<0.001
Medical imaging technology	50 (40, 60)	80.5 (71.8,86)	-8.960	<0.001
Z value	1.643	2.777	-	-
P value	0.101	0.006	-	-

3.5. Students' Scores of Various Abilities after Blended Teaching Reform

After the blended teaching reform, the median scores of the students of the two majors in independent learning ability, critical thinking ability, problem-solving ability, communication and expression ability, teamwork ability and innovation and creativity ability are 4 points, which is a high score. There was no statistical difference between the scores of the two majors ($P > 0.05$) (Table 4).

Table 4. Scoring of various abilities of students in different majors after the reform of blended teaching

Group	independent learning	critical thinking	problem-solving	communication and expression	teamwork	innovation and creativity
Health services and management	4 (4,5)	4 (4,4.3)	4 (4,4.8)	4 (4,4.8)	4 (4,5)	4 (3.3,4)
Medical imaging technology	4 (3.3,5)	4 (3.7,4.7)	4 (3.7,5)	4 (3.7,5)	4 (3.8,5)	4 (3.3,4.5)
Z value	0.590	0.856	0.307	0.592	-0.426	-0.672
P value	0.555	0.392	0.759	0.553	0.670	0.502

4. Discussion

The students participating in this teaching reform have a high overall satisfaction with the blended teaching of preventive Medicine based on the "SPOC+BOPPPS" model under the OBE concept, and some students have a low satisfaction with this course, which may be due to the large number of online resources and various online tasks provided by this teaching reform, leading to greater learning pressure for students. The students have a positive attitude towards video resources, and the completion of pre-class tests and homework is good, while the completion of after-class discussions and group tasks is poor. This may be because the after-class discussion and group task mainly examine students' comprehensive application ability of theoretical knowledge. The students in our school generally have a general ability of basic disciplines, and their comprehensive application ability of theoretical knowledge is relatively insufficient. In terms of group tasks, students majoring in medical imaging technology scored better than those majoring in health service and management, which may be because students majoring in medical imaging technology had one year of on-the-job internship experience, while students majoring in health service and management had not participated in a professional internship and were generally lacking in practical ability.

The scores of formative evaluation, final examination and course evaluation of students majoring in health service and management are higher than those in medical imaging technology, mainly because the scores of online assignments and mid-term examination of students majoring in health service and management are generally higher than those in medical imaging technology major. Students majoring in Medical Imaging Technology still need to improve their enthusiasm for learning this course, and the teaching design of this course needs to be further optimized. After the blended teaching reform, students' evaluation of this course and scores of various abilities were higher, and there was no statistical difference between groups. It shows that blended teaching reform can be accepted by the vast majority of students and is conducive to improving students' comprehensive ability.

This study has the following advantages: First, under the guidance of the OBE concept, researchers apply the "SPOC+BOPPPS" model to the blended teaching reform of preventive medicine, and the research design is innovative; Secondly, the online task scores are generated automatically by the Chaoxing g platform according to the completion of students' tasks, and the scores are objective. Finally, the researchers attach importance to students' feedback, collect students' feedback on this course through anonymous form, and evaluate the scores of students' comprehensive ability after teaching reform, which has important reference significance for optimizing teaching design in the future.

5. Conclusion

Under the concept of OBE, the student's satisfaction with the SPOC+BOPPPS model applied to the blended teaching of

preventive medicine is higher, and the overall teaching effect is good. However, there are still a small number of students with insufficient satisfaction and learning enthusiasm, so it is necessary to continuously optimize the teaching design to further enhance students' learning interests and the learning effect of this course.

Author Contributions

Jiang Lili and **Jia Tinghui** contributed to the study conception and design. **Jiang Lili** conducted the reform and analyzed all the data. **Chen Hui** helped **Jiang Lili** collect the data and checked the results of all data analysis. The first draft of the manuscript was written by **Jiang Lili and Jia Tinghui**. **Chen Hui, Gao Jing and Zhou Tiantian** helped to modify the manuscript. All authors read and approved the final manuscript.

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