

Application of Blended Teaching Model Based on SPOC and TBL in Dermatology and Venereology

Jinrong Zeng

Third Xiangya Hospital

Liyao Liu

Third Xiangya Hospital

Xiaoliang Tong

Third Xiangya Hospital

Lihua Gao

Third Xiangya Hospital

Lu Zhou

Third Xiangya Hospital

Aiyuan Guo

Third Xiangya Hospital

Lina Tan (✉ tanlinawork@163.com)

Third Xiangya Hospital

Research Article

Keywords: Dermatology, Venereology, small private online course, team-based learning, clinical medicine, medical education

Posted Date: May 6th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-463111/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background In this study, we applied the small private online course (SPOC) and team-based learning (TBL) blended teaching model to dermatology and venereology to ensure a higher quality learning experience for clinical medical students.

Methods A total of 52 fifth-grade clinical undergraduates from Xiangya School of Medicine of Central South University were randomly divided into an experimental ($n = 26$) and a control group ($n = 26$). In March 2018, we used the SPOC and TBL blended teaching model in the experimental group and explored the effects of innovative teaching in the dermatology and venereology course, compared with the control group receiving the conventional teaching method. We analyzed the two groups' theoretical assessment scores and questionnaire results to evaluate the efficiency of the new pedagogy.

Results Students in the experimental group had a better understanding than the control group of the dermatology and venereology content and higher scores on the case analysis questions in the final theoretical examination. The results revealed that the majority of the experimental group students agreed that the novel teaching model blended with SPOC&TBL helped them significantly stimulate motivation and develop their ability in self-directed learning, independent thinking, literature retrieval, presentation board, teamwork, communication, and systematic clinical thinking. The teaching satisfaction survey of the two groups showed that the students' satisfaction in the experimental group was significantly higher than in the control group ($p < 0.05$).

Conclusions The SPOC&TBL teaching model is better than the traditional one in enriching students' professional knowledge and cultivating their comprehensive ability. It can effectively promote educational quality, improve students' learning effects, and enhance their satisfaction. This method has broad application prospects.

Background

Cultivating high-quality medical talents characterized by professionalism and innovation is the theme of educational reform in medical colleges and universities in the 21st century. With the medical environment revolution, higher standards, with a solid reserve of professional knowledge, excellent comprehensive qualities, and innovative capabilities, have been advanced for licensed doctors. Meanwhile, the curriculum of medical schools has seen reforms in recent years, and the course duration compressed. This conveys a message that it is mandatory to provide advanced and notable clinical medical education in a limited course duration. Therefore, many medical schools have reformed projects to improve teaching effects. These have partly been accomplished, but some issues remain. Clinical teaching methods need to be explored and optimized.

Small private online courses (SPOCs) were first proposed by Professor Armando Fox [1] at the University of California, Berkeley in 2013. They are based on massive open online courses (MOOCs). The SPOC platform has the same abundant educational resources as a MOOC [2], as well as simpler management

procedures and lower administration expenses. SPOCs have developed vigorously worldwide in the last few years, bringing a new look to medical education. The team-based learning (TBL) teaching model was proposed by Michaelsen at Oklahoma University in 2002 [3]. It advocates that students are the core of learning activities, cooperating with the team to complete tasks [4]. It can contribute to improving learning efficiency and enable students to apply basic knowledge to clinical cases. The effectiveness of TBL has been confirmed in the teaching practices of many subjects. By establishing two tracks, online (SPOC platform) and offline (TBL classroom), the new hybrid model realizes the importance of the teaching process and its innovativeness.

Dermatology and venereology, a compulsory course for students in clinical medicine, has unique characteristics. As secondary subjects, they study more than 2,000 diseases with complex etiologies involving immune, genetic, infectious, environmental, and other factors, of which the main clinical manifestations are morphological changes. Many students find it difficult to form a preliminary diagnosis by identifying skin lesions in clinical work, even after theoretical learning and clinical probation. In addition, some hold biased stereotypes about dermatological diseases or care about the infectivity of some diseases. Under the influence of these negative cognitions, students lack initiative and enthusiasm in learning dermatology and venereology. Consequently, there is an urgent need to reform the education methods. In this study, we carried out an innovative trial by introducing the hybrid SPOC and TBL teaching model into dermatology and venereology courses, hoping that the novel program can propel students' interest in them, raise their learning efficiency, cultivate the ability to solve clinical cases, and help them combine theoretical knowledge with clinical practice.

Methods

1.1 Participants and Study Setting

The ethics of this study has been approved by the IRB (Institutional Review Board) at the Third Xiangya Hospital, Central South University, China. A total of 52 undergraduate students admitted to Xiangya School of Medicine in 2013 were selected for the research. They were divided into an experimental ($n = 26$) and a control group ($n = 26$) according to the design of this innovative project. There were 13 men and 13 women in the experimental group, aged between 21 and 24 years, with an average age of 22.9 ± 0.6 , and 12 men and 14 women in the control group, aged between 21 to 24 years, with an average age of 23.0 ± 0.4 . No significant difference was observed in gender, age, or other information between the two groups ($p > 0.05$). The project lasted for two semesters, from March 2018 to March 2019.

1.2 Educational Strategies

The students in the control group followed the traditional teaching model, in which teachers used the PPT to explain professional knowledge in class. The experimental group adopted a hybrid teaching model that combined the SPOC platform and a TBL curriculum, and the implementation process was as follows: (1) The students in the experimental group were divided into four categories, each with six or seven members. Teachers had to comprehensively analyze students' learning ability, personality characteristics,

and other factors for the purpose of grouping them in a balanced way. The members elected a student as the group leader, a person who had a sense of responsibility for the team and who coordinated the team's task distribution and cooperation. (2) Based on the MOOC course of dermatology and venereology uploaded previously, we established an independent SPOC course aimed at medical students in Central South University that was conducive to completing the education reform of the hybrid model based on the SPOC course. Depending on the prearranged plan, students logged on to the SPOC platform to watch the videos for self-directed study before the TBL curriculum and formed the primary knowledge network [2, 5]. (3) On completing the online course, students could access discussion topics and clinical cases for the following week's lectures. The cases discussed in this class had to cover fundamental theories and key points. Some complex cases were designed to guide them to discuss and communicate, aiming to deepen their understanding. Each participant had to complete the tasks by discussing them collectively, and the group leader subsequently recorded when members studied collectively [6]. (4) The personal test that all the students had to complete within the limited time before attending the TBL class consisted of 10 multiple-choice questions, including the fundamental definition and critical points. The purpose of this pre-class assessment was to estimate the effect of students' preparation. This section took about 10 minutes. (5) Each group chose one member to present the PPT, revolving around pre-class discussion topics and clinical cases [7]. This took about 60 minutes. (6) The teacher presented extended questions and comprehensive clinical cases for students to discuss immediately, which focused on fostering their team spirit and encouraging them to discuss and interact until reaching a consensus. Finally, the teacher collected the answer sheets of all the groups and asked them to evaluate the team members' performance in the group and their contribution to the outcome [8]. If there was a dispute, teachers could organize a discussion; students debated until reaching a consensus. The teacher had to pay attention and provide clues when necessary. This took about 30 minutes. (7) The teacher conducted a systematic evaluation at the end of the course, summarized the key points, corrected the errors, expanded the knowledge points, and commented on the class performance of the groups. This took about 20 minutes.

1.3 Evaluating the Effect of Teaching Model Application

1.3.1 Theoretical Examination

At the end of the semester, the teacher prepared the examination according to the syllabus and administered a theoretical exam to the two groups covering five concepts (15), 25 multiple choices (50), and five comprehensive analysis questions (35), and calculated the two groups' scores.

1.3.2 Collect Questionnaires about SPOC&TBL Pedagogy

A questionnaire survey was conducted among students of the experimental group after the SPOC&TBL course. To assess the effectiveness of this new teaching method, eight aspects were investigated, including studying motivation, self-directed learning, independent thinking, literature retrieval ability, presentation skills, teamwork ability, communication skills, and clinical thinking ability [9]. The questionnaire was voluntarily filled out and anonymously handed.

1.3.3 Survey on Teachers Satisfaction

The students' satisfaction with the pedagogy of the two groups was evaluated along seven dimensions: pedagogy satisfaction, personal performance satisfaction, improved ability by taking class, valuable educational content, appropriate classroom pace, satisfaction with teachers, and requirements of more SPOC and TBL training. The questionnaire was completed and anonymously handed.

1.4 Statistical analysis

SPSS software (version 22.0) was used to analyze the data. Continuous variables were expressed as ($\bar{x} \pm s$), and two-sample *t*-tests were used for between-group comparisons. Categorical data were expressed as percentages and tested using Pearson chi-square tests. Statistical significance was set at $p < 0.05$.

Results

3.1 The SPOC&TBL Group Scored Higher on the Comprehensive Analysis Questions

There was no significant difference in the average scores of concepts and multiple choices between the two groups ($p > 0.05$). When comparing the average scores of the comprehensive analysis questions between the two groups, the mean score of the SPOC&TBL group (31.27 ± 1.91) was significantly higher than the mean scores of the control group (29.54 ± 2.89), as displayed in Table 1. Our study confirmed that the SPOC&TBL teaching model had more advantages in cultivating students' ability to analyze and solve clinical issues.

Table 1
Comparison of the test scores between two groups

Groups (SPOC&TBL $n=26$ Non-SPOC&TBL $n=26$)	Terminology test scores ($\bar{x} \pm s$)	Multiple choice question scores ($\bar{x} \pm s$)	Comprehensive analysis question scores ($\bar{x} \pm s$)
SPOC&TBL	12.19 ± 1.72	42.23 ± 2.85	31.27 ± 1.91
Non-SPOC&TBL	12.23 ± 2.03	42.15 ± 3.44	29.54 ± 2.89
<i>t</i>	-0.074	0.088	2.549
<i>p</i>	0.941	0.930	0.014

3.2 SPOC&TBL Pedagogy to Improve Comprehensive Ability of Students

Table 2 displays eight items regarding the questionnaire results about the effectiveness assessment of SPOC&TBL teaching model. We used the number and percentage of options to describe the students'

attitude. The majority agreed that SPOC&TBL helped them raise their studying motivation, independent learning, independent thinking, document retrieval skills, presentation skills, teamwork ability, communication skills, and clinical thinking, indicating that SPOC&TBL hybrid teaching model yielded satisfactory educational effects in dermatology and venereology, improved students' comprehensive ability, and helped students better adapt to clinical work.

Table 2
Analysis of the capabilities obtained by the SPOC&TBL group

Items	Percentage (%)	
	Yes	No
Studying motivation	69.2	30.8
Self-directed learning skills	61.5	38.5
Thinking independently	73.1	26.9
Document retrieval ability	53.8	46.2
Presentation skills	76.9	23.1
Teamwork ability	80.8	19.2
Communication skills	69.2	30.8
Clinical thinking ability	76.9	23.1

3.3 Results of Satisfaction Survey in the SPOC&TBL Group

Table 3 displays seven dimensions of the satisfaction survey toward the pedagogies that the two groups received. Overall, the response frequency indicated that significant differences ($p < 0.05$) were observed between the SPOC&TBL and the non-SPOC&TBL group for the following statements: "pedagogy satisfaction"; "personal performance satisfaction"; "improved ability by taking the class"; valuable educational content"; and "appropriate classroom pace". There was no significant difference was observed in "satisfaction with teachers" and "requirements of more SPOC & TBL training" between the SPOC&TBL group and the non-SPOC&TBL group ($p > 0.05$).

Table 3
Evaluation of teaching method satisfaction

Groups		Agree	Neutral	Disagree	χ^2	<i>p</i>
(SPOC&TBL <i>n</i> = 26 Non-SPOC&TBL <i>n</i> = 26)		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Pedagogy satisfaction	SPOC&TBL	18(69.2%)	5(19.2%)	3(11.5%)	9.99	0.006
	Non-SPOC&TBL	7(26.9%)	15(57.7%)	4(15.4%)		
Personal performance satisfaction	SPOC&TBL	16(61.5%)	8(30.8%)	2(7.7%)	7.789	0.019
	Non-SPOC&TBL	6(23.1%)	16(61.5%)	4(15.4%)		
Improve ability by taking class	SPOC&TBL	19(73.1%)	6(23.1%)	1(3.8%)	6.803	0.023
	Non-SPOC&TBL	10(38.5%)	15(57.7%)	1(3.8%)		
valuable teaching content	SPOC&TBL	20(76.9%)	6(23.1%)	0(0.0%)	8.951	0.008
	Non-SPOC&TBL	10(38.5%)	12(46.2%)	4(15.4%)		
Appropriate classroom pace	SPOC&TBL	21(80.8%)	5(19.2%)	0(0.0%)	18.502	0.00
	Non-SPOC&TBL	7(26.9%)	10(38.5%)	9(34.6%)		
Satisfaction with teachers	SPOC&TBL	16(61.5%)	7(26.9%)	3(11.5%)	1.946	0.473
	Non-SPOC&TBL	9(42.3%)	11(38.5%)	6(19.2%)		
Requirements of more SPOC & TBL training	SPOC&TBL	13(50.0%)	10(38.5%)	3(11.5%)	0.488	0.851
	Non-SPOC&TBL	15(57.7%)	9(34.6%)	2(7.7%)		

Discussion

In the conventional teaching model, the teacher deconstructs the disease into several parts and then imparts the findings to the students [10], which helps their comprehension under the pace of the class. However, it is challenging for students to adapt to clinical practice, as accounting for theoretical knowledge in the course has little connection with clinical cases [11]. Moreover, students seldom think and explore independently, so they are prone to boredom and lack motivation. The traditional teaching model has an obvious limitation, and there is a need for an innovative one to exercise students' ability in multiple aspects to cultivate higher-quality clinical talents.

As a novel teaching model, SPOC and TBL are different from conventional teaching ones. They break up the teacher-centered tradition and highlight the dominant position of students in teaching practice [12, 13]. As an online track, SPOC is beneficial for stimulating learning motivation by introducing diverse and vivid teaching modules. In addition, it encourages a sense of responsibility and urgency in students for learning, which helps to raise the completion rate of online lessons. Students utilize SPOC courses to build a primary knowledge system before the TBL class, and they can watch the video repeatedly to overcome challenging issues [14]. Moreover, we use the TBL curriculum as an offline track because only online courses cannot immerse students while studying. The TBL recommends that they learn task-oriented ones and study independently. Many studies have shown that students learn more by solving problems than by being provided with standard answers; they attempt to construct interpretation more than they receive hermeneutics [15]. Students learn better following an active method, and this knowledge leaves a profound impression. They cultivate the spirit of cooperation and inspire thought during team discussions in the TBL model [16]. In addition, clinical cases, which are selected and designed carefully by teachers, promote students' ability to analyze related issues.

In general, the hybrid teaching models of SPOC and TBL have many advantages and broad application prospects. However, they remain little applied in education. The curriculum reform in this study confirmed that the SPOC&TBL teaching model contributed to improving students' ability to solve clinical issues. Most of the students agreed that the new teaching model helped them by stimulating their motivation to study and develop versatile abilities. If we hope to popularize the SPOC&TBL curriculum in many more areas, there are still issues that need to be addressed.

3.1 Improvement of the Quality of the Teacher Team

Unlike the conventional teaching method, the identity of the teacher has changed in the SPOC&TBL curriculum, which requires professional competence and teaching skills. With a dominant role in the traditional curriculum, the teacher controls the structure, content, and pace of the curriculum, which is not the case in the SPOC&TBL hybrid teaching model. In the SPOC platform, the teacher collects and integrates learning resources and materials to facilitate students' independent online learning [17]. In the TBL curriculum, the teacher encourages students to communicate and discuss, resolve doubts and provides flexible and personalized academic guidance. This healthy interaction contributes to the quality of education. Simultaneously, it also indicates that teachers in the SPOC and TBL curriculum need professional knowledge, substantial clinical experience, and excellent leadership capability.

3.2 Optimize the Design of Course and Platform

The selection and design of educational materials for online and offline courses must be continuously optimized according to the characteristics and needs of students. Ideally, independent studying before attending the course helps students establish a knowledge system sufficient to participate in clinical case discussions. To achieve this goal, we should pay attention to their needs and constantly upgrade the SPOC platform. For example, construct a systematic knowledge network and ensure that SPOC courses do not omit essential knowledge points as far as possible. If necessary, add a review section on the

platform to help students memorize the knowledge. Add video content navigation and mark the progress bar in the long video to help locate the content pertinently and quickly. In offline TBL courses, it is essential to determine the difficulty of clinical cases for discussion. If we select too complicated cases, it may be difficult for students to find the correct answer, while if it is simple, it is not easy to attract their attention. Teachers should elaborate on abstract concepts in offline courses to supplement online ones, as this is conducive to the internalization and dialectics of knowledge. Some scholars have advocated a combination of TBL and traditional teaching methods in offline classes [18].

3.3 Pay Attention to Mental Health of Students and Individualized Counseling

Students are used to the conventional teaching model and cannot immediately adapt to the new one. Schools can insert the SPOC&TBL curriculum into the traditional one starting from the freshman year [19]. Students who excel are likely to exert peer pressure to others in the group, some of whom may even gradually lose confidence [20]. In addition, some students do not have enough motivation and seldom participate in group tasks. Therefore, it is vital to balance the relationship between individual work and teamwork. Teachers can make members take turns as team leader and organize regular meetings to report their learning progress. While students majoring in clinical medicine have academic pressure, if the task of the SPOC&TBL course is heavy, the quality of students' task completion may decline, which also needs to be addressed in practice.

3.4 Improve the Management and Assessment System

Determining a scientific and systematic method to evaluate students' performance and learning outcomes has always been challenging. Completing an online course on the SPOC platform relies mainly on their initiative and discipline. The website's supervision mechanism was relatively weak. Although teachers can communicate with students in the class via the Internet, some online presence is limited to their "online identity." Some students contribute little to the TBL group, but obtain high scores by relying on their teammates' excellent performance. This implies that we need to reform platform construction and establish a more scientific evaluation system in the future.

Conclusion

There has been no research on the application of the SPOC&TBL teaching model in dermatology and venereology courses. In this study, we introduced it for the first time. Our study confirmed that the teaching model effectively promoted students' performance and had a positive impact on their learning motivation and comprehensive quality. However, the SPOC and TBL curricula still need improvement, and the effectiveness needs to be verified in teaching practice over an extended period. Our innovative exploration has provided a new perspective for curriculum reform of clinical medicine, and we believe that its education will have a qualitative leap in the future.

Abbreviations

SPOC

small private online course; TBL:team-based learning; MOOC:massive open online courses

Declarations

Ethics approval and consent to participate

The ethics of this study has been approved by the IRB (Institutional Review Board) at the Third Xiangya Hospital, Central South University, China. Study was carried out in accordance with the ethical guidelines of Central South University. All participants were aware that they were taking part in this research and gave written informed consent in addition to confirming that they would allow us to use their collected data anonymously for publication. All the data were anonymously collected and analyzed.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and analyzed in this study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no conflict of interest.

Funding

This work was supported by Education and Teaching Reform Research Project of Central South University(2018jy122) and Youth Foundation Project of Natural Science Foundation of Hunan Province(2018JJ3797).

Authors' contributions

TL and GA designed and carried out the study, ZL collected and analyzed data, ZJ and LL wrote the manuscript, TX and GL helped revise the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We would like to thank the participating students for willingly taking time to provide the information and data needed to complete this study. We also thank the personnel distributing the questionnaire.

References

- [1] Amna H Hashmi, HarvardX. Set to launch second SPOC [EB/OL].<http://harvardx.harvard.edu/links/harvardx-set-launch-second-spoc-harvard-crimson-amna-h-hashmi-september-16-2013,2014-:07-10>.
- [2] Yahong Wang, Lin Wang, Hongwei Liang, Dean Zollman, Lulu Zhao, Yan Huang. Research on the small private online course (SPOC) teaching model incorporating the just. *European Journal of Physics*, 2020, 41(3).
- [3] Larry K Michaelsen, Arletta Bauman Knight, L. Dee Fink. *Team-based learning: A transformative use of small groups* [M]. New York: Praeger, 2002: 1-288.
- [4] Dean Parmelee, Larry K Michaelsen, Sandy Cook, Patricia D Hudes. Team-based learning: a practical guide: AMEE guide no. 65. *Medical Teacher*, 2012, 34(5): e275-87.
- [5] Jun Chen. Exploration and application of SPOC-based Blended teaching mode in comprehensive English course. *Journal of Physics: Conference Series*, 2019, 1237(2).
- [6] Karl E Mingos. Team-based learning in the clinical setting: Perspectives of doctor of nursing practice students. *Journal of Doctoral Nursing Practice*, 2019, 12(1): 41-45.
- [7] Huali Liu. Teaching of college mathematics culture course based on JITT and TBL teaching method. *Creative Education Studies*, 2019, 7(1).
- [8] Yan Ji, Limei Wang, Yusheng Li, Xinjing Liu. Application analysis of the team-based learning method in neurology teaching. *Creative Education Studies*, 2016, 4(2).
- [9] Qiu Yan, Li Ma, Lina Zhu, Wenli Zhang. Learning effectiveness and satisfaction of international medical students: Introducing a Hybrid-PBL curriculum in biochemistry. *Biochemistry and Molecular Biology Education*, 2017, 45(4): 336-342.
- [10] Klegeris Andis, Bahniwal Manpreet, Hurren Heather. Improvement in generic problem-solving abilities of students by use of tutor-less problem-based learning in a large classroom setting. *CBE Life Sciences Education*, 2013, 12(1).
- [11] Lee Oi Sun. The effect of the problem-based learning on critical thinking disposition, academic self-efficacy and self-leadership of nursing students -Diagnostic tests and nursing-[J]. *Journal of Digital Convergence*, 2020, 18(5).
- [12] Arif Alper Cevik, Margaret ElZubeir, Fikri M Abu-Zidan, Sami Shaban. Team-based learning improves knowledge and retention in an emergency medicine clerkship. *International Journal of Emergency Medicine*, 2019, 12(1): 6.
- [13] Lindsay K Davidson. A 3-year experience implementing blended TBL: active instructional methods can shift student attitudes to learning. *Medical Teacher*, 2011, 33(9): 750-753.

- [14] Youwen Jin. Exploration of Mixed Teaching Reform of Film and television Advertisement Design Course based on SPOC. *International Journal of Education and Management*, 2018,3(3).
- [15] Joel Michael. Where's the evidence that active learning works? *Advances in Physiology Education*, 2006,30(4): 159-167.
- [16] Stephanie James, Peter Cogan, Marianne McCollum. Team-Based Learning for Immunology Courses in Allied Health Programs. *Frontiers of Immunology*, 2019,10:2477.
- [17] Zhang Xiao-Min, Yu Jian-Yun, Yang Yuan, Feng Cui-Ping, Lyu Jing, Xu Shi-Lian. A flipped classroom method based on a small private online course in physiology. *Advances in Physiology Education*, 2019,43(3).
- [18] Lian-Hong Yang, Long-Yuan Jiang, Bing Xu, Shu-Qiong Liu, Yan-Ran Liang, Jin-Hao Ye, En-Xiang Tao. Evaluating team-based, lecture-based, and hybrid learning methods for neurology clerkship in China: A method-comparison study. *BMC Medical Education*, 2014, 14: 98.
- [19] Mona Mlika, Rim Charfi, Sarah Cheikhrouhou, Faouzi Mezni. About the association of a lecture-based learning and team-based learning in a pathology course. *Annales de Pathologie*, 2020, 40(3): 329-336.
- [20] Paul Haidet, Karla Kubitz, Wayne T McCormack. Analysis of the team-based learning literature: TBL comes of age. *Journal on Excellence in College Teaching*, 2014,25: (3-4).