

# Influence of SPOC Classroom Teaching on E-Learning Satisfaction

<https://doi.org/10.3991/ijet.v17i12.31761>

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**Abstract**—With the rapid development of modern communication technology, more “Internet+” behaviors have been adopted in the field of education. Realizing the teaching objectives via the Internet mode can meet the personalized learning needs of more learners across time and space. In a SPOC class, teachers can encourage learners to actively participate in the E-learning process by adopting various task-driven teaching methods. The BOPPPS teaching mode can provide a complete teaching framework for teachers, achieve good teaching results, and improve the E-learning satisfaction of learners. A regression analysis was performed to explore how six aspects of the BOPPPS teaching mode in SPOC classrooms affected E-learning satisfaction. Results show that the overall Cronbach’s  $\alpha$  of the questionnaire was 0.887, the KMO value was 0.869, and the corresponding  $p$ -value was 0.000, indicating good reliability and validity. Five aspects of the BOPPPS teaching mode (bridge-in, object, pre-assessment, participatory learning, and post-assessment, summary) have a significant influence on E-learning satisfaction. The acceptance time of the BOPPPS teaching mode had different effects on E-learning satisfaction ( $p < 0.05$ ). Results of this study have a positive reference value for improving the application mode of SPOC teaching design at different teaching levels, expanding the application of the BOPPPS teaching mode in E-learning, and promoting the use of BOPPPS teaching mode in the higher education.

**Keywords**—SPOC, teaching mode, e-learning satisfaction

## 1 Introduction

With the rapid development and maturity of Internet technology, it has continuously promoted the transition of online education to online education, and various universities in China and abroad have also begun their attempt to conduct online education. In the field of China higher education, E-learning emerged as a variety of online learning forms, such as mobile learning, virtual learning, and ubiquitous learning. The traditional education mode has failed to meet the learning needs of learners, thus spurring the pervasiveness of online education and gradual transformation into a new normal in the education context. With the integration of information technology into teaching, diversified teaching forms have emerged in the field of education, such as micro-class,

MOOC, flipped classrooms, and online classrooms. Additionally, they have been implemented in actual teaching. At present, as an effect of the epidemic, more and more Chinese universities are habitually adopting the E-learning mode, designing, and developing many online courses so that both teachers and students can experience better efficiency and convenient learning services while realizing their personalized learning needs. However, a physical space separation also exists between teachers and students in E-learning. Thus, further improving the organizational form of class teaching and promoting the learning input of learners are both necessary. Using SPOC, as an important model, is convenient to achieve this purpose. SPOC can realize the full integration of classroom teaching and E-learning. It is the link between the traditional teaching mode and online teaching, which promote learners to gradually step from shallow learning to deep learning and then improve their learning performance and satisfaction. In the SPOC mode, learners can systematically understand and master the teaching content of courses by learning relevant teaching resources online before class. They can also engage in more valuable activities in class. For teachers and students who are participating in discussions and answering questions together, the learning time would be flexible and interactive, which could ensure the quality of teaching.

In China, all kinds of colleges and universities attach great importance to the cultivation of talents and successfully accumulate human resources by cultivating higher education talents. In the whole process of talent training, the quality of courses had a very important construction value. During the full implementation of the E-learning process, improving the effectiveness of SPOC classroom teaching mode design could be more satisfied with the goal of cultivating talents. Among the many teaching modes, the BOPPPS teaching mode adopted a micro-teaching mode for training, which had strong operability and effectiveness, and it slowly developed from the original application in teacher skills training to the application in classroom teaching. Many universities worldwide have introduced and applied the BOPPPS teaching mode. Its application practice fully showed that the BOPPPS teaching mode was an effective teaching mode, which could improve student participation in class. Through a more effective teaching process, the teaching mode could facilitate the deeper internalization of knowledge into the knowledge system of learners and promote learners' realization of the knowledge transfer process more fully. In particular, it played a very important role in higher-order thinking, such as decision-making, discussion, and problem-solving. In the SPOC course, the BOPPPS teaching mode could provide further effective face-to-face guidance for teachers, thereby allowing learners to obtain added learning support from teachers and peers. Through fuller interaction and emotional communication, learners could reduce the obstacles in the learning process, determine other accurate learning methods, develop better learning habits, and promote more efficient learning. Therefore, in SPOC class, adopting the BOPPPS teaching mode had very important theoretical value and application space for improving college students' E-learning satisfaction.

## **2 Theoretical basis and hypothesis**

### **2.1 Theoretical basis**

Morrison [1] believed that the BOPPPS teaching mode attached great importance to the ownership status of middle school students in the teaching process under the guidance of the teaching concept advocated by constructivism theory. Teachers were the instructors and observers during the whole teaching process; created a real situation in the class; helped students complete tasks through the design of group discussions, role-playing, and other interactive ways; fully improved the learning initiative of students to allow them full participation in classroom activities; actively completed the goal of new knowledge construction. Constructivism is a theory used to discuss learning and knowledge. Given that the learning process of human beings was accompanied by cognitive development, a close relationship was found between them. It could explain the process of human learning cognition through constructivism and properly explain how to learn, how to construct meaning, and how to form concepts and other phenomena. Constructivism considers learning as a process of meaning construction through teacher-student interactions and student-student interactions in a certain teaching environment. In this context, teachers do not teach the knowledge that must be acquired by the learners. Instead, the latter takes the initiative to construct meaning with the aid of teachers or other people in a certain social environment and relevant learning materials. Teachers design the appropriate context of teaching content so that students could perform meaning construction while ensuring collaboration and conversational communication among learners in the process of meaning construction. Moreover, they help learners achieve a deeper understanding of the essence of things reflected in the learning content. Constructivism emphasizes that the learning process must be completed by learners under the guidance of teachers.

### **2.2 Hypothesis**

The BOPPPS teaching mode originated from classroom teaching. The literature previously focused on the application and practice of the BOPPPS teaching mode in traditional classroom teaching. With the enrichment and diversification of teaching theories and educational practice forms, other researchers and teachers have applied the BOPPPS teaching mode to various teaching environments and carried out relevant practical research in different types and different levels of schools, including improving teaching effect by using this teaching mode in a traditional classroom, online teaching, online and offline mixed teaching, and other teaching modes. With respect to how the BOPPPS teaching mode affected learning motivation and learning performance of learners, Giustini [2] demonstrated that all aspects of the OPPPS teaching mode were designed to achieve teaching objectives and had strong operability. Yang et al. [3] found that micro-teaching based on the BOPPPS model could stimulate the students' interests and enthusiasm and improve their thinking ability while helping teachers produce innovative teaching ideas and improve teaching quality. Zhang [4] demonstrated that employing the BOPPPS strategy was highly effective in cultivating the creativity

and collaborative learning of students. Cui [5] discussed how to apply the BOPPPS model to oral Chinese teaching as a foreign language. It found that the BOPPPS model could improve the efficiency and effectiveness of oral Chinese teaching, mobilize the enthusiasm of international students to learn Chinese, and improve their academic performance. Ma et al. [6] examined the cognition and influence of the BOPPP model on the learning results of students and found that learners adopting the BOPPP model significantly improved their cognitive scores in skills, initiative, self-control, self-efficacy, motivation, and academic performance. Shih et al. [7] found that the BOPPP teaching method could bring more teacher-student interaction and interesting class, explore the practical application in daily life, and thus significantly improve their learning effect. Foxe et al. [8] took the basic computer courses in colleges and universities as an example and found that the BOPPP teaching method adopted in the classroom was to explore the design and application of network teaching mode to stimulate students' interest in learning and improve the effect of network teaching. Zhou [9] found that the BOPPPS model allowed students to participate in class, stimulate their interest and initiative in learning, and improve the effectiveness of teaching quality. Huang et al. [10] found that the BOPPPS teaching model could effectively improve student participation, enhance their learning motivation, and cultivate their independent thinking and learning ability. Xu [11] demonstrated that integrating the BOPPPS model into primary school English teaching could effectively improve teacher-student interaction and student-student interaction, and the activities should be diversified and interesting. Zhang [12] believed that effectively combining the BOPPPS model and PBL teaching method could cultivate students' comprehensive participation in learning ability, which was a useful tool to improve the teaching effect. Li [13] discussed the application and effect of the BOPPPS teaching method in surgical nursing practice teaching and found that the experimental group who adopted the BOPPPS teaching model had better self-evaluation of learning effect than the control group in improving learning interest, activating class atmosphere, clarifying learning objective, improving knowledge retention ability, and enhancing learning initiative and communication ability. Yang et al. [14] found that the BOPPPS teaching model could significantly improve the learning performance level of learners. Onjewu et al. [15] demonstrated that the university entrepreneurship education system had a direct and significant influence on cultivating entrepreneurial ability and forging the entrepreneurial mentality of students. Stefanic et al. [16] indicated that it played an important role in student satisfaction by increasing the frequency of interaction with teachers and peers in class and optimizing the overall curriculum design and class organization and management. Ghina [17] found that the education of college students by implementing entrepreneurship projects was conducive to improving college students' satisfaction. Al-Atabi et al. [18] found that as a large-scale open online course, MOOC was a suitable entrepreneurship education platform, which could improve individual's emotions on key aspects of entrepreneurship. Cirulli et al. [19] showed that MOOCs could support personalized learning and cultivate college students' ability in the field of technology entrepreneurship. From the existing research literature, the BOPPPS teaching model emphasized the leading role of bridge-in, object, teacher-student communication, participatory learning, testing, and summary for students while retaining the original teaching process. At present, the scope of BOPPS

teaching mode in application research is relatively extensive from the application research of science and engineering to mixed mode research [20]. The research which focused on the BOPPPS teaching model was primarily conducted to analyze the practicability of the model and verify its effectiveness of this model through teaching practice. The BOPPPS teaching model modularized the teaching process, which could be divided into six stages: bridge-in, object, pre-assessment, participatory learning, post-assessment, and summary. Therefore, this paper also used these six stages as independent variables of the BOPPPS teaching model to analyze how the BOPPPS teaching model affected the E-learning satisfaction in SPOC and provided references and suggestions for improving the quality of courses and cultivating college students. In summary, this paper proposed the following six assumptions.

- H1: in SPOC, Bridge-in can effectively improve E-learning satisfaction.
- H2: in SPOC, Object can effectively improve E-learning satisfaction.
- H3: in SPOC, Pre-assessment can effectively improve E-learning satisfaction.
- H4: in SPOC, Participatory-Learning can effectively improve E-learning satisfaction.
- H5: in SPOC, Post-assessment can effectively improve E-learning satisfaction.
- H6: in SPOC, Summary can effectively improve E-learning satisfaction.

### **3 Methodology**

#### **3.1 Questionnaire design**

The author designed a questionnaire about the “Influence of SPOC classroom teaching mode design on E-learning satisfaction,” which included three parts and contained a total of 41 questions. The first part sought the basic information of the questionnaire respondents, including four questions: gender, major, grade, and the acceptable length of the BOPPPS teaching mode. The second part asked respondents to score the six aspects of the BOPPPS teaching mode, with a total of 26 questions, corresponding to 4, 5, 5, 3, 4, and 5 questions. The third part asked about the E-learning satisfaction. This study used the questionnaire designed by Douglas et al. [23] with a total of 11 questions. All questions were scored using a 7-point Likert scale.

#### **3.2 Research object**

SPOC has been extensively used as the main method of E-learning. SPOC teaching in various universities in Jiangsu Province has also achieved relatively obvious results by increasing the construction of E-learning platforms and introducing a large number of high-quality E-learning curriculum resources. In this paper, a questionnaire survey was implemented among undergraduates in the school of Economic Management of a university in Jiangsu of China. During the pandemic, the school of Economic Management has fully applied SPOC in at least one course or more in each grade of each major by increasing teacher training, investing in the construction of E-learning platform, and requiring teachers to carry out the reform in the school teaching mode. Such a good

foundation in the E-learning environment allowed college students to experience good E-learning information literacy. This study took the free time of students to conduct the questionnaire survey. A total of 396 questionnaires were distributed, and 375 of them were recovered; 344 of them were valid, with an effective recovery rate of 86.87%. According to the statistics on basic information of respondents, males accounted for 160 (46.51%) and females 184 (53.49%); 42 freshman (12.21%), 76 sophomores (22.09%), 152 juniors (44.19%), and 74 seniors (21.51%); 51 students were from International Economics and Trade (14.83%), 88 students from Finance (25.58%), 46 students from Economic Statistics (13.37%), 115 students from Accounting (33.43%), and 44 students from Human Resources Management (12.79%).

## 4 Result analysis

### 4.1 Reliability and validity analysis

Table 1 shows that the overall Cronbach’s  $\alpha$  value of the questionnaire in this paper was 0.887, and the Cronbach’s  $\alpha$  value of these 6 variables was also higher than 0.8, manifesting good reliability.

**Table 1.** Test results of reliability

Variable name	No. of question	Correction term correlation (CITC)	Coefficient $\alpha$ value of the item deleted	Cronbach’s $\alpha$ value	Cronbach’s $\alpha$ value
Bridge-in	A1	0.676	0.901	0.896	0.887
	A2	0.804	0.854		
	A3	0.791	0.858		
	A4	0.812	0.850		
Object	B1	0.772	0.915	0.925	
	B2	0.734	0.922		
	B3	0.837	0.902		
	B4	0.845	0.901		
	B5	0.841	0.901		
Pre-assessment	C1	0.896	0.895	0.928	
	C2	0.765	0.922		
	C3	0.830	0.907		
	C4	0.818	0.910		
	C5	0.756	0.921		
Participatory-Learning	D1	0.702	0.794	0.845	
	D2	0.702	0.794		
	D3	0.731	0.766		
Post-Assessment	E1	0.809	0.827	0.884	
	E2	0.821	0.822		
	E3	0.863	0.805		
	E4	0.516	0.928		

Summary	F1	0.909	0.905	0.935
	F2	0.784	0.931	
	F3	0.843	0.917	
	F4	0.826	0.920	
	F5	0.789	0.927	
Learning satisfaction	Y1	0.611	0.890	0.898
	Y2	0.592	0.891	
	Y3	0.606	0.891	
	Y4	0.673	0.887	
	Y5	0.708	0.884	
	Y6	0.702	0.885	
	Y7	0.761	0.881	
	Y8	0.799	0.879	
	Y9	0.779	0.880	
	Y10	0.392	0.905	
	Y11	0.412	0.904	

Table 2 indicates that the questionnaire has good validity, KMO value was 0.869, and the corresponding *p*-value was 0.000.

**Table 2.** Test results of validity

<b>Value</b>		0.869
<b>Bartlett spherical test</b>	<i>Approximate chi-square</i>	10226.191
	<i>df</i>	666
	<i>p</i>	0

#### 4.2 Correlation analysis

Table 3 shows that E-learning satisfaction had no significant direct correlation with object and summary, but it had significant correlations with bridge-in, pre-assessment, participatory learning, and post-assessment, which laid the foundation for regression analysis.

**Table 3.** Correlation coefficient

	Learning satisfaction	Bridge-in	Object	Pre-assessment	Participatory learning	Post-assessment	Summary
Learning satisfaction	1	-	-	-	-	-	-
Bridge-in	0.106*	1	-	-	-	-	-
Object	0.039	0.354**	1	-	-	-	-
Pre-assessment	0.210**	0.109*	0.273**	1	-	-	-
Participatory learning	0.149**	0.436**	0.342**	0.127*	1	-	-
Post-assessment	0.134*	0.277**	0.250**	0.035	0.293**	1	-
Summary	0.067	0.209**	0.243**	0.092	0.267**	0.630**	1

### 4.3 Regression analysis

Table 4 shows the following:

**H1 was valid.** In SPOC, Bridge-in could effectively improve the E-learning satisfaction, because it needs better teacher-student interactions in the SPOC teaching model. Therefore, teachers should fully understand students' original cognition of new knowledge before class. Then, they can take it as a starting point of teaching to make students experience cognitive conflicts and form new cognition. The bridge-in of strategies aims to attract students' curiosity and quickly focus their attention. The ultimate goal of Bridge-in is to connect with the content needs to teach next, allowing learners to first warm-up before adjusting their E-learning state to the main content. The BOPPPS teaching model could enable students to keep pace with the rhythm of class through Bridge-in, which would then improve their learning enthusiasm. Through continuous questioning by teachers, they could focus their attention and improve their E-learning efficiency. Therefore, teachers could quickly capture the students' attention, improve their E-learning enthusiasm, and strengthen the E-learning atmosphere through perfect bridge-in. Students could quickly integrate into the E-learning state and more actively adjust their E-learning state.

**H2 was valid.** In SPOC, Object could effectively improve the E-learning satisfaction because the class object refers to the E-learning tasks to be completed and the learning effect to be achieved by students. The BOPPPS teaching model emphasizes that the teachers should inform students of the teaching objectives before the beginning of the course, what they need to do, and what they need to learn. Doing so allows the students to clarify the direction and difficulty of E-learning. Teachers could avoid setting excessively high or extremely difficult goals that would reduce students' enthusiasm and activity by setting phased objectives on the bases of the curriculum framework. The effective and measurable phased objective will continuously meet students' learning enthusiasm on the premise that students can complete them and largely stimulate their enthusiasm and confidence to follow teachers in continuing to learn after obtaining a phased sense of achievement.

**Table 4.** Linear regression result

	Standardized coefficient	<i>t</i>	<i>p</i>	VIF	<i>F</i>
Constants	-	7.947	0.000**	-	<i>F</i> (6,337)=10.415, p=0.000
Bridge-in	0.120	2.089	0.037*	1.322	
Object	0.192	3.371	0.001**	1.296	
Pre-assessment	0.197	3.740	0.000**	1.105	
Participatory learning	0.210	3.662	0.000**	1.311	
Post-assessment	0.201	3.216	0.001**	1.556	
Summary	0.068	1.090	0.277	1.538	

\**p*<0.05, \*\**p*<0.01

**H3 was valid.** In SPOC, Pre-assessment could effectively improve E-learning satisfaction. The pre-assessment strategy was also prepared for improving the efficiency of



classroom teaching, with its purpose to achieve rapid communication between teachers and students. This process will allow teachers to fully understand the existing knowledge reserve and cognition of students and analyze whether conflicts will have occurred with the new knowledge and identify the location of the conflict point. Pre-assessment could be implemented through open questions, preview, brainstorming, and discussion. Through pre-assessment, teachers could gain a relatively full understanding of the basic learning situation of students, know the students' mastery of learning content, and use more accurate teaching behavior to make appropriate adjustments for the preview preparation of teaching content taught in class. Teachers could also set and adjust their objectives according to the specific teaching objectives of the class, and adjust teaching content. Thus, they could control the teaching rhythm in accordance with the students' actual situation. Through pre-assessment feedback of students, teachers could understand the basic knowledge level of students for entrepreneurship courses. In this link, students could express their learning expectations and show their knowledge reserved to teachers through pre-assessment and help teachers improve their teaching ideas and methods.

**H4 was valid.** In SPOC, Participatory-Learning could effectively improve E-learning satisfaction. The participatory-learning strategy was the key link in the application of the whole BOPPPS teaching model. In this participatory-learning link, what they pursued more was the deep interaction and emotional communication between teachers and students as well as among students. In SPOC, through participatory learning, teachers could adopt more scientific and reasonable teaching methods in class to provide students with learning initiative and enthusiasm to participate. In this way, students can fully engage in classroom learning and achieve teaching objectives through good interactions between teachers and students. Participatory learning is the core link of the BOPPPS teaching model and the core of the whole classroom teaching. Everyone could participate in class with a strong E-learning atmosphere by opening the mic, controlling the screen, typing in the dialog box, and other ways. Therefore, the treatment methods taken by teachers are very important. Teachers are required to be flexible in this link. They reasonably use a variety of modern teaching methods and various teaching resources to create a relaxed and happy learning link and motivate many students to actively participate in learning. Through more active and efficient interactions between teachers and students, teachers could fully master students' knowledge construction and digestion and absorption of learning content. By improving the attention and involvement of learners in class, students could maintain a relatively high intensity of learning involvement to avoid distraction, sitting in front of the screen, not paying attention to the lectures, and killing time. Thus, it could help students achieve their E-learning objectives and complete the set teaching objectives.

**H5 was valid.** In SPOC, Post-assessment could effectively improve E-learning satisfaction. The core purpose of the post-assessment strategy is to investigate the students' grasp of the E-learning content and check whether students have completed the learning objectives and the degree of achievement of learning objectives. For class teaching, the result of post-assessment is a necessary link for teachers to evaluate students. Additionally, learners need to understand and evaluate the achievement of their learning objectives. Through such post-assessment link, students could identify the gap

and make corresponding learning plans, which would be conducive to improving the teaching process and teaching design via student learning feedback and then improve the teaching effect. The summary and reflection of students' learning situation and teaching content could be included in the post-assessment line, which could not only ensure the integrity of teaching steps but could also save teaching time.

**H6 was invalid.** In SPOC, Summary has not effectively improved E-learning satisfaction because the concentration of E-learning is insufficient in the “Summary” link due to excessive links of the BOPPPS teaching model, especially under online environment, teacher evaluation, peer evaluation, and because self-evaluation of learners could be realized asynchronously after class. Many teachers and learners easily ignore this link and do not even effectively conduct a summary evaluation. This finding also suggests that when teachers adopt the BOPPPS teaching model, they should reserve adequate time for students to participate in the summary process in the last 3-5 min of each class, which could allow the students to briefly analyze their grasp of new content and set expectations for student performance in the next class.

#### 4.4 Non-parametric test analysis

Table 5 shows that the non-parametric test was used to study the difference between the acceptance time of the BOPPPS teaching model and E-learning satisfaction, implying a significant difference between the acceptance time of the BOPPPS teaching model and E-learning satisfaction ( $p < 0.05$ ). Indeed, although the BOPPPS teaching mode has been used in teaching practice for many years, students needed some time to accept it. It found that the E-learning satisfaction of students will increase gradually along with a gradual increase in the acceptance time of the BOPPPS model. By adopting the BOPPPS model with extra time and additional courses, college students could gain a deeper understanding of the essence of the six teaching links in the BOPPPS model. Extra attention was also paid to the use of the BOPPPS model with adequate courses and time, thereby affording both teachers and students extra time to understand and master this kind of teaching mode and render the BOPPPS teaching mode more operable. Such atmosphere was conducive to the smooth teaching of teachers and ultimately improved the E-learning satisfaction of learners.

**Table 5.** Non-parametric test result

Learning satisfaction	Acceptance time of the BOPPPS teaching model Median						Kruskal-Wallis Test statistic H value	Value
	1.0 (n=6)	2.0 (n=11)	3.0 (n=84)	4.0 (n=90)	5.0 (n=139)	6.0 (n=14)		
	3.455 (2.8,3.8)	4.010 (3.6,5.5)	4.636 (3.6,5.1)	4.755 (4.0,4.9)	4.545 (3.9,5.0)	4.909 (3.7,5.5)	13.047	0.023*

\*  $p < 0.05$ , \*\*  $p < 0.01$

## 5 Conclusion

Using modern information technology for teaching has become an appealing trend of global education innovation. In SPOC class, the BOPPPS teaching mode can effectively stimulate learners to learn and improve their E-learning satisfaction. This study explored how the six aspects of the BOPPPS teaching mode affect the E-learning satisfaction by regression analysis. The results showed that the overall Cronbach's  $\alpha$  coefficient of this questionnaire was 0.887, the KMO value was 0.869, and the  $p$ -value was 0.000, indicating good reliability and validity. The five aspects of the BOPPPS teaching mode (bridge-in, object, pre-assessment, participatory learning, and post-assessment) had a significant influence on the E-learning satisfaction. A difference also exists between the acceptance time of the BOPPPS teaching model and E-learning satisfaction ( $p < 0.05$ ). Thus, future research can further examine the BOPPPS teaching mode in the aspects of comparative teaching experiments of different levels of teaching classes to further refine the design of teaching activities and expand the sample of experimental objects.

## 6 Acknowledgment

This study was supported by the General Research Project on Philosophy and Social Science in Jiangsu Universities in 2021 (No.2021SJA2101) and the Special Key Project on "Labour Education for College Students" and "Basic Course Cluster" in Jiangsu Universities in 2021 (No.2021JDKT022) and the Research Project on Undergraduate Education and Teaching Reform in Jiangsu University of Science and Technology in 2021 (No. XJG2021059).

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Article submitted 2022-04-17. Resubmitted 2022-05-20. Final acceptance 2022-05-20. Final version published as submitted by the authors.