

Exploration and practice of BOPPPS model in the teaching reform of pharmaceuticals

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Abstract. Pharmaceuticals is one of the core courses of pharmacy with strong practicality, wide range of knowledge and strong professionalism, and effective teaching model is crucial for its teaching. The BOPPPS model was one of the effective teaching models, which emphasize students' all-round participatory learning, and can fully mobilize students' subjective initiative. In this paper, the BOPPPS model has been applied to the reform of pharmaceuticals teaching based on Mooc classroom as the information support platform of teaching process. The results revealed that the application of BOPPPS model in pharmaceuticals teaching could effectively improve students' learning enthusiasm, and the academic performance and teaching effect were significantly improved. The application of BOPPPS teaching model in pharmaceuticals teaching is conducive to improving the level of professional education and cultivating high-quality professionals with rich theoretical knowledge, strong operational ability and "craftsman spirit".

1 Introduction

Pharmaceuticals is one of the core courses of pharmacy, which involves the design theory, prescription technology, production technology, quality control and reasonable application of drug dosage forms and preparations, which needs to meet the actual requirements of preparation technology and clinical medication with strong practicality, wide range of knowledge and strong professionalism [1].

"Learning Pyramid" tells us that in traditional teaching methods reading, listening and reading pictures can only make students remember 10-30% of knowledge, but 70-90% of which can be remembered by participating in discussions, speaking, making reports, telling others, experiencing in person and hands-on learning experiences[2]. The core of BOPPPS teaching model is to emphasize students "all-round" participatory learning, which embodies the educational concept of "student-centered and teacher-led". It can fully mobilize students subjective initiative and make them change from passive learning to active learning. The application of BOPPPS teaching model is of great significance to cultivate skilled talents with rich theoretical knowledge and strong operational ability, reform teaching model and strengthen students professional ability[3,4].

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This paper explores and practices the application of BOPPPS teaching model in the teaching reform of pharmaceuticals, based on the MOOC platform, taking the teaching of "nano-preparation" as an example, and hopes promoting the reform of pharmaceutical teaching and providing some useful reference for other professional course teaching model reform.

2 Pharmaceuticals teaching based on BOPPPS model

2.1 BOPPPS teaching model overview

BOPPPS teaching model is an application model of flipped classroom, originated in Canada, and is highly respected in the training of university teachers in North America. As an advanced and effective teaching method, BOPPPS teaching model in colleges and universities in the field of pharmaceutical education in China is gradually being applied to the exploration and practice of teaching reform^[5].

The BOPPPS model has been explored and combined with flipped classroom teaching model of Treatise on Febrile Diseases, it's found that the model can promote students' autonomous learning, ensure the teaching content, improve students' classroom participation and learning depth, cultivate clinical thinking, and improve teaching effect^[6]. It has also been discussed the curriculum design and practice of integrating scientific research training of college students into pharmaceuticals experiment under the BOPPPS model. The results showed that the application of BOPPPS model could strengthen the cultivation of students' scientific research ability in the experimental course stage, help to improve scientific research literacy, and cultivate comprehensive, innovative and applied pharmaceutical talents^[7].

2.2 BOPPPS teaching of pharmaceuticals based on MOOC

BOPPPS model emphasizes the modular and interactive teaching. If students do not complete the "learning first" step as required, and do not carry out extracurricular learning or the quality of extracurricular learning is low, it will lead to increased classroom pressure and fail to achieve the desired teaching effect. At present, as the "post-epidemic" era, the "online" teaching platform has been gradually improved. MOOC, Chaoxing Learning, Rain Classroom and other teaching platforms have provided strong support for our teaching reform. They have the advantages of large scale, openness and wide resources and complete teaching modules, which can effectively enable students to master the autonomy of learning, learn anytime and anywhere, and are not limited by time and space^[8].

In this paper, through the six modular teaching links of BOPPPS teaching model, combined with MOOC platform as "online" learning and communication platform, the exploration and practice of pharmaceuticals teaching reform are carried out.

2.2.1 Bridge-in

The introduction of this link is mainly to guide students to focus or think about the course content to be learned. Different forms of import can be any form of phenomenon, case, story, personal experience, social problems related to the theme. In the teaching of nanopreparations, the magical characteristics of nanotherapy are introduced through the case of leukemia treated by medical nanorobot of Harbin Institute of Technology. How should pharmaceutical workers use nanotechnology to prepare drugs? What are the

characteristics of nanopreparations? How to design safe and effective nanopreparations? With these problems, students begin to learn next

2.2.2 Objective

This stage is mainly completed through online learning, generally not arranged in the offline classroom. Students learn excellent teaching videos and PPTs produced or shared by teachers or departments through the SPOC online course module of MOOC. The learning purpose of this chapter should be clearly described, such as the content mastered, the content understood, the focus and difficulty highlighted. For example, when learning the knowledge of "nanopreparation", the carrier materials and preparation methods of nanopreparation should be mastered. The development history of nanopreparations should be understood. Targeted research is the key and difficult point, which needs to be focused on.

2.2.3 Pre-assessment

This link is completed in the "online" classroom, and can be achieved through small tests, open questions, discussions, etc. Teachers can use MOOC "practice" module, "questionnaire" module or "discussion" module to investigate. Generally Choice and judgment questions are the first choices. Teachers need to fully understand students' mastery of knowledge points. What are easily confused and wrong knowledge points? Around the teaching purpose, according to students' mastery of knowledge points, flexible adjustment of participatory teaching content progress and depth. For the learning content of nano-preparations, a small test can be set up according to the knowledge point database, and the basic knowledge points can be investigated by single-choice questions, multiple-choice questions and judgment questions, so as to understand the students' autonomous learning and knowledge mastery.

2.2.4 Participatory learning

According to the results of the pre-test, various teaching strategies are designed before class to improve students' classroom participation. Based on the knowledge points that are easy to be mixed, error-prone, key and difficult, participatory teaching is carried out by combining classroom explanation, flipped classroom, group discussion with doubtful problems, practical operation, case study and situational simulation. The students were divided into several groups, and multiple topics were set up such as "active targeting", "passive targeting", "long-circulating stealth technology", "magnetic targeting", "embolism targeting", "heat-sensitive targeting", "pH targeting". Through case analysis, group discussion and flipped classroom, students were asked to explain the knowledge points and feelings of learning as "small teachers", and share learning experience with everyone. Teachers can make appropriate supplements and guidance to deepen the understanding of theoretical knowledge in practical explanation, profoundly understand the essence of knowledge points, improve students' professional quality, and cultivate "craftsman spirit" of seeking truth from facts and excellence.

2.2.5 Post-assessment

The post-test is used to examine whether the teaching goal is achieved. In this section, the investigation methods are flexible and diverse. Teachers can use the MOOC "practice"

module, "questionnaire" module or "discussion" module for testing. By solving specific application problems, students' mastery of knowledge points is investigated. In the process of learning nanopreparations, we can closely follow the pretest and the posttest of the key and difficult points in participatory learning. Through case analysis, brief answer and discussion, we can examine students' mastery of key and difficult knowledge points.

2.2.6 Summary

This part is the last link of BOPPPS teaching model. On the basis of the previous links, teachers can summarize with students through mind mapping and connect fragmented knowledge to the network, which is convenient for students to consolidate their learning in the future. Students can also make a summary of their short-term learning experience according to their own learning situation, in order to judge the learning effect that has been achieved.

3 Teaching effect evaluation

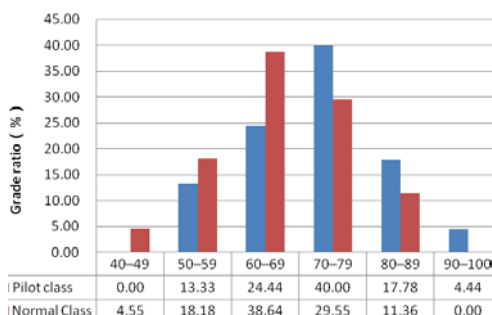


Fig. 1. Comparison of scores between pilot class and normal class.

In this paper, based on the MOOC classroom teaching platform and the six modular links of the BOPPPS teaching model, we explored the teaching reform of pharmaceutics. In order to comprehensively evaluate the teaching effect of this teaching model, after the final closed-book examination at the end of the course study, the scores were statistically processed by the mean difference *t* test of the two samples and expressed as mean ± standard deviation. The statistical results show that the average score of the pilot class is 74.33±10.82, and that of the normal class is 65.26±12.35(Fig.1.). The score of the pilot class is significantly higher than that of the normal class ($p < 0.05$).

In order to evaluate the teaching effect, 45 questionnaires were distributed after class and 45 were recovered, with a recovery rate of 100 %. The survey results show that most students can accept this teaching model and obtain better learning effect. It can improve the effect of pre-class preparation (84.44%), stimulate learning interest (80%), and improve the efficiency of offline teaching (88.89%). It is helpful to cultivate students' ability to solve problems (80%), consolidate review after class (84.44%), and significantly improve the effect of communication with teachers (88.89%).

4 Conclusion

In this paper, the application of BOPPPS teaching model combined with MOOC classroom in the teaching reform of pharmaceutics was explored and practiced, in order to unify

ideological guidance and professional education, and cultivate high-quality professionals with rich theoretical knowledge, strong operational ability and "craftsman spirit".

Table 1. Survey results of students' learning effect.

Teaching efficiency	Helpful		Not much help		helpless	
	Number	Proportion%	Number	Proportion%	Number	Proportion%
Pre-class preparation	38	84.44%	4	8.89%	3	6.67%
Stimulating interest in learning	36	80.00%	6	13.33%	3	6.67%
The efficiency of class listening	40	88.89%	5	11.11%	0	0.00%
Problem solving ability	36	80.00%	7	15.56%	2	4.44%
After-school review	38	84.44%	5	11.11%	2	4.44%
Communication with teachers	40	88.89%	5	11.11%	0	0.00%

As a result, under this teaching model, teachers can effectively organize classroom teaching, or re-evaluate and revise the previous teaching contents, provide clear and achievable learning objectives for students, guide students to participate in the teaching process actively, timely feedback learning effect information, fully mobilize students' subjective initiative in learning, cultivate their "craftsman spirit" of finding, analyzing and solving problems. This teaching model can effectively organize teaching process, improve teaching effect, and improve teaching level, which has wide application value.

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