



A Model of Hybrid Teaching Innovation Based on Computer Technology and Algorithm Innovation

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Abstract. To improve the teaching effectiveness of course, the paper created an innovative design for the “teaching pain points” in the teaching process. With computer technology and algorithm innovation, the paper established a hybrid online and offline teaching innovation model, innovated in five aspects - innovation of course concept, innovation of teaching design, innovation of teaching content, innovation of teaching method and innovation of evaluation method. The model of “BOPPPS teaching model + Chaoxing learning platform + rain classroom + PBL problem-oriented method + TBL team learning method” based on BLOOM teaching taxonomy was created and statistically analyzed by questionnaire and SPSS software. The results showed that 88.2% of the surveyed students were satisfied with the course in general, 98% of the students spoke up in class and completed the pre-study through Chaoxing learning platform, and 92% of the students preferred the rain classroom teaching or the combination of rain classroom and traditional teaching. Through teaching innovation, the course has achieved the reform results of high student motivation, strong learning interest, improved practical ability, and continuous optimization of the course.

Keywords: Blended learning innovation · BOPPPS · Computer Technology · Algorithm Innovation

1 Introduction

The BOPPPS originated from the Canadian ISW program in the 1970s and is based on the theories of Constructivism and communicative approach, emphasizing the student-centeredness of the teaching process. (Li Shuang, Fu Li, 2020) [1]. BOPPPS breaks the limitations of the traditional classroom and is a new teaching model that emphasizes student participation and interaction and feedback, and is known for effective teaching (Yang Fan, Yang Tianming, 2021) [2]. In recent years, many scholars in China have combined other teaching approaches on the basis of the BOPPPS model to take advantage of the strengths of the university classroom. In practical courses, Xie Wei and other scholars (2019) believe that the BOPPPS+PBL teaching model can promote teaching from “inside the classroom” to “inside and outside the classroom” [3]. Xu Yun (2021) advocates that the introduction of BOPPPS+PBL teaching model in the curriculum can effectively

develop English teacher training students' classroom teaching skills [4]. In terms of cultivating teamwork, Liu Linlin (2020) believes that the "BOPPPS+TBL" model can help cultivate excellent rule of law talents in public security in terms of teamwork, rational and innovative thinking, and practical and hands-on skills. [5] With the development of information technology, the Rain Classroom has also joined the BOPPPS camp. According to Dong Guiwei et al. (2020), the teaching mode of "BOPPPS + Rain Classroom" integrates and standardizes students' fragmented learning time in class, and serves as a good reminder for students who have not yet established good pre-learning and revision habits [6]. Tian Li et al. (2021) demonstrated that the BOPPPS model based on the "Rain Classroom" has realized the organic integration of information technology and BOPPPS model and demonstrated the concept of inquiry-based teaching. [7] Wang Yuchao et al. (2022) concluded that the instructional design method based on Rain Classroom and the BOPPPS improvement model can improve the problems of the traditional BOPPPS model such as lack of in-depth understanding of the learning situation, poor error tolerance, untimely learning effect testing, and insufficient connection between lessons and sessions [8]. Zhang Mingyong (2019) evaluated that the blended teaching model based on Chaoxing Learning Platform under the BOPPPS effectively overcomes the disadvantages of traditional classroom restricted by time and space, and facilitates students to use fragmented time for anytime and anywhere learning. [9] Based on the BOPPPS model, this study organically integrates Chaoxing Learning Platform, Rain Classroom, PBL, TBL, and integrates training games, case studies, character interviews, group discussions, student presentations, etc. The online and offline hybrid teaching is effectively connected, and through teaching innovation, the course achieves high student motivation, strong learning interest, improved practical ability, and continuous optimization of the course through teaching innovation, the course has achieved high student motivation, strong learning interest, improved practical ability and continuous optimization of the curriculum.

2 Course Development

"Training and Development" is a specialized (required) course for Human Resource Management majors. The course has been offered every year for the past five years, and the number of lecturers is about 100, and more than five classes of students have been trained on campus. The course is based on the concept of cultivating students with "national sentiment, responsibility, cultural heritage, scientific spirit, innovative thinking, and legal awareness" and has the status and role of a "foundation stone". This course is applicable to the second year of human resources management students, the prerequisite courses are management, human resources management, followed by courses such as performance management, recruitment and hiring, social security, compensation management. Since the establishment of this course, it has been taught by experienced teachers as the course leader, and the teaching effect is good.

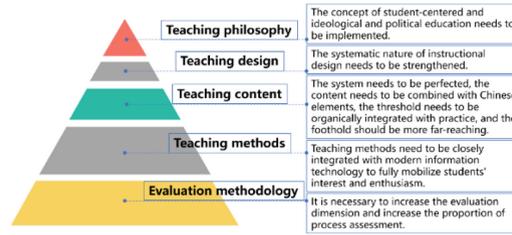


Fig. 1. Teaching pain point problem

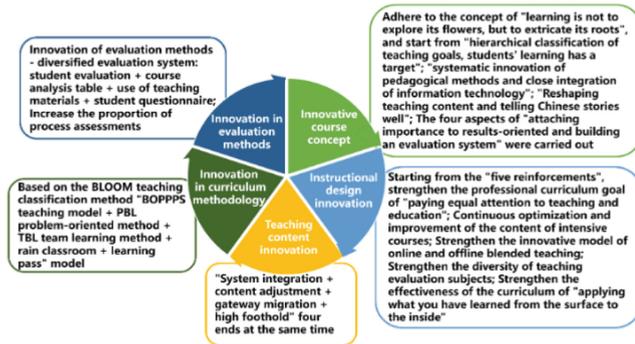


Fig. 2. Main features and innovations of the course

3 Analysis of "Painful Problems" in Teaching

In the course of course construction, through collecting feedback from employers, social demand surveys, student feedback and self-reflection, the following problems were found in the teaching process (see Fig. 1).

4 Innovative Ideas and Approaches

4.1 Innovative Ideas

The key features and innovations of this course include five aspects: innovation of course concept, innovation of teaching design, innovation of teaching content, innovation of teaching method and innovation of evaluation method (see Fig. 2).

4.2 Innovative Ways

1) Curriculum concept innovation – "learning is not to explore its flowers, but to pull up its roots."

We insist on "learning is not exploring its flowers, but pulling out its roots", cultivating students' habit of thinking and ability of getting to the bottom, focusing on students,

attaching importance to the integration of ideological education and gender, and starting from “stratifying and classifying teaching objectives, targeting learning; systematically innovating teaching methods, closely combining with information technology; reshaping teaching contents, telling the Chinese story; attaching importance to result-oriented, building evaluation system”. The four aspects of the course are: “stratified classification of teaching objectives and targeted learning; systematic innovation of teaching methods and close integration with information technology; reshaping of teaching contents and telling the Chinese story; emphasis on result-oriented and evaluation system”.

2) Innovation in teaching design - starting from “five enhancements”.

The team has sorted out the five major pain points of teaching and learning, and designed a system of innovation starting from “five enhancements”.

- (1) Strengthen the objective of professional courses to "teach and educate people at the same time". Combined with the requirements of the national "new liberal arts" talent training program, the course team teachers promote the synergy of education and education through the development of thinking and political elements and case design, adhere to the student-centered, pay attention to the integration of thinking and political education and gender once.
- (2) Strengthen the continuous optimization and improvement of course content. In the “one main line”, “two foundations” and “four key competencies” based on increased training and needs analysis, the development of training plans, training implementation, training effectiveness evaluation, etc. The class time of key chapters.
- (3) Strengthen the online and offline hybrid teaching innovation model. We use training games, case studies, enterprise visits, interviews, group discussions, student presentations, and the “BOPPPS + Chaoxing Learning + Rain Classroom Platform + PBL + TBL” model based on the Bloom’s taxonomy of educational objectives to improve students’ learning ability and course The learning effect.
- (4) Strengthen the diversity of teaching evaluation subjects. The “three-stage” process assessment mode is adopted, with grades consisting of classroom performance, regular grades, and final grades. Through the process of diversified assessment, students’ classroom speech is recorded and rewarded with points, which cultivates and enhances students’ interest in learning and independent learning ability. The internal assessment is strengthened in the course teaching, and self-assessment, other assessment and mutual assessment are introduced to achieve the purpose of mutual learning and improvement.
- (5) Strengthen the effect of the course “from the surface to the inside and the application of learning”. The subject competition has a positive effect in stimulating students to increase their knowledge of science and technology and motivate them to study professionally. Through the formation of subject competition teams, we can promote teaching and learning through competitions, and realize the integrated mode of “teaching, class and competition”. With the platform of “National Student Organization and Management Competitions” and other competitions, we promote the integration of discipline competitions and curriculum system in terms of competition

connotation, innovation ability cultivation, curriculum construction and academic style construction.

3) Course content innovation – “system integration + content adjustment + gateway migration + high foothold” four ends and the same action.

- (1) System integration: based on “one main line”, “two foundations” and “four key competencies”. The course knowledge objective “one main line” refers to the main line of cultivating comprehensive management skills for management positions; “two bases” is the basic knowledge of training and development system; the second is training and development ideas, including the evolution process and latest trends of training and development ideas. Course competency objectives “four key competencies”, covering training and needs analysis, training plan development, training organization and implementation capabilities and training effectiveness evaluation capabilities. The objective of the course is to cultivate new business successors with “integrity and professionalism” and “innovation, responsibility and sustainable development”.
- (2) Content adjustment: The teaching hours of chapters and knowledge points such as training and needs analysis, training plan development, training implementation, and training effect evaluation have been increased. Secondly, some chapters have been reduced and compressed, while a large number of fresh cases have been substituted to achieve a better combination of theory and practice. In response to the fact that the theory of training and development is abstract and students’ cognition of theory and practice is limited, two parts of “Interview and Debriefing” and “Case Study and Debriefing” have been added.
- (3) The gate is moved forward: insisting on practice and application-oriented ability cultivation strengthening, emphasizing students to reflect and summarize through theory, and being able to apply theory to enhance the creative ability of project practical operation.
- (4) Highly grounded: to serve the “dual domestic and international development pattern” and the “long-term development of the Guangdong-Hong Kong-Macao Greater Bay Area”.

4) Curriculum method innovation - “BOPPPS + Chaoxing Learning Platform + Rain Classroom + PBL + TBL” model based on Bloom’s taxonomy of educational objectives.

The training games, case studies, character interviews, group discussions, student presentations, and the “BOPPPS+Chaoxing Learning Platform+Rain ClassroomPBL+TBL+” model (see Fig. 2) were introduced to improve students’ learning ability and the effectiveness of the course (Fig. 3).

- (1) BOPPPS six-step teaching method: BOPPPS model as a closed-loop teaching model of teaching interaction and reflection, for the achievement of teaching objectives, the original knowledge learning process is divided into six learning units, i.e. introduction, objectives, pre-test, participatory learning, post-test and summary [10], using

Format of teaching			Before class		During class					After class			
			Xuexitong		Based on "BOPPPS + Xuexitong + Rain Classroom + PBL + TBL" Model							Xuexitong	
			Pre-class	Bridge-in	objective	Pre-test	Participatory learning	Post-test	summary	Review after class			
A Model of Online and Offline Hybrid Teaching Innovation	On-line	Teacher	Publish learning tasks	Publish Import Case (Rain Classroom)	Publish learning objectives	Pre-release questions (Rain Classroom)	Create a group activity. Activities such as random selection (Rain Class)	Teacher evaluations		Post consolidation exercises Expand tasks Score			
	Off-line	Student	Conduct pre-study tasks	Review before receiving imported cases (Rain Classroom)	View Learning Objectives (Rain Classroom)	Answer (Rain Class)	View group activity. Send Barrage (Rain Classroom)	Knowledge Test (Rain Classroom)	Do mind maps and word clouds	Receive consolidation exercises. Expand tasks. Peer evaluation			
	On-line	Teacher	Q&A personality guidance	Summary of reviews	Explain the learning objectives	Focus on the previous test error questions	Lecture on PPT PBL problem-oriented approach TBL team discussion method	Focus on the analysis of post-test error questions	Teacher reviews	Personality guidance			
	Off-line	Student	Questions	Raise hand to answer. Pre-class review case study	Clarify learning objectives	Check the answers to previous questions	Keep thinking and answering questions. Raise your hand to speak. Breakout sessions	Check the answers to the post-test questions		Questions			

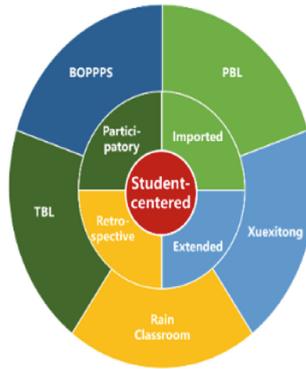


Fig. 3. Computer Technology and Algorithm Innovation

the Bloom’s taxonomy of educational objectives to classify the teaching objectives of each chapter, so that students clearly understand the teaching objectives of each knowledge point. On the basis of this, we innovate and improve students’ learning methods, and arrange students to study in advance to broaden their thinking by means of group exploration and extended project assignments.

- (2) PBL: By continuously throwing out problems, we “converge → diverge → converge again → diverge again” together with students. The emphasis is on independent, evidence-based, and multifaceted interactive learning.
- (3) TBL: This course adopts the point system, and the points of individuals are counted into the team at the same time to form the team points, and finally the usual grades are awarded. Cooperative group learning is a teaching activity that takes cooperative learning groups as the basic form, systematically uses the interaction between dynamic factors in teaching to promote students’ learning, and uses the group’s performance as the evaluation criterion to jointly achieve teaching goals [11].

- (4) “Rain Classroom+Chaoxing Learning Platform”: Combine Rain Classroom and Chaoxing Learning Platform to make beneficial use of students’ fragmented time for learning and realize “online+offline” in which “educated people can receive education anytime and anywhere using the Internet”. The “online+offline” hybrid course teaching. Teachers send relevant resources to students through the Chaoxing Learning platform, students complete pre-learning in advance, and teachers can test students’ pre-learning effect in class through Rain Classroom, giving students more time to speak and discuss, so that students can think and learn more independently.

5) Evaluation method innovation - diversified evaluation system + increase the proportion of process assessment.

- (1) Innovation in course evaluation methods: diversified evaluation, training and development of course evaluation system including student evaluation, course analysis form, use of teaching materials, student questionnaires, etc.
- (2) Course assessment method: In response to the insufficient proportion of process assessment evaluation, this course increases the proportion of process assessment, using a combination of process assessment and summative assessment. Process assessment: the usual grade is 40%. Among them, attendance accounts for 5%, classroom performance (discussion session) accounts for 5%, homework 20%, Rain Classroom accounts for 5%, study through the task point 5%. Summative assessment: 60% of the paper score. The knowledge points of the test paper is distributed in the teaching contents of each chapter, and the proportion of comprehensive test questions is increased.

Through the combination of diversified evaluation, process assessment and summative assessment, students’ learning interest and independent learning ability are cultivated and enhanced. While improving the external evaluation mode of the course, we strengthen the promotion role of internal evaluation in the teaching of the course and introduce self-evaluation, other evaluation and mutual evaluation methods to achieve mutual learning and improvement through self-reflection and mutual enlightenment. Classroom students’ speeches will be recorded for point reward and also counted as team points, which greatly mobilizes students’ enthusiasm and interest in learning.

5 Conclusion

The course adopts a blended teaching model to achieve the integration of “online+offline”. Based on the BOPPPS model, students’ pre-learning on the Chaoxing Learning Platform before class, use the Rain Classroom to check the pre-learning effect, and use the PBL and TBL for sublimation and discussion. Students respond well and the assessment scores are always excellent, achieving the expected teaching effect.

According to the OBE education concept, the effectiveness of teaching activities should be evaluated based on what students have learned, and the continuous improvement of the course should be based on the evaluation of the course. Therefore, this course conducted a questionnaire survey on the application and reform of teaching,

Table 1. Results of the survey questionnaire

Courses Satisfaction	Sub-total	Number of speeches	Sub-total	Xuexitong Pre-study time	Sub-total	Teaching Preference	Sub-total
Very satisfied	21 (22%)	≥10 times	9 (10%)	≤15 min	46 (49%)	Traditional Teaching	7 (7%)
Satisfied	62 (66%)	5–10 times	37 (39%)	15–30 min	37 (39%)	Rain Classroom Teaching	7 (8%)
General	11 (12%)	3–4 times	22 (23%)	30 min–1 h	8 (9%)	Combination of the two	80 (85%)
Dissatisfied	0 (0%)	1–2 times	24 (26%)	1 h–1.5 h	0 (0%)		
Very dissatisfied	0 (0%)	0 time	2 (2%)	≥1.5 h	3 (3%)		
Total	94 (100%)						

mainly involving the evaluation system, the quality of teachers' teaching, the achievement of competency, and the post-improvement. It was statistically analyzed by SPSS software, 88.2% of the surveyed students were highly satisfied with the course in general, about 98% of the students would take the initiative to speak in class and complete the pre-learning through the study pass, and 92% of the students preferred the Rain Classroom teaching or the combination of Rain Classroom and traditional teaching (see Table 1). The results of the survey data show that students have an elevated level of approval of the faculty team and the evaluation system.

This course allows the traditional classroom-based “teacher-centered, textbook-centered, classroom-centered” one-way knowledge transfer mode gradually transformed into “based on a wide range of learning resources, student-centered, problem-centered, activity-centered” model. The reform effect of high student motivation, strong interest in learning, improved practical ability, and continuous optimization of the curriculum by teachers has been achieved.

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