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Innovation and Practice of Online and Offline Hybrid PAD and PBL Teaching Model

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Abstract. The overall P-PAD-L teaching system of "1 body, 2 wings, 3 steps and 4D feedback" has been innovated: 1 body means PBL and PAD integration, 2 wings are online and offline classrooms, 3 teaching steps include teacher' presentation, students assimilation, discussion and dialogue, 4D feedback comes from learning process and results, self-evaluation and peer evaluation. In the past three years,the teaching team has followed the educational action research of "problem-plan-implementation-reflection" steps to refine the teaching system.The effectiveness of teaching innovation system has been successively reflected and confirmed in student development and curriculum construction deepening.

Keywords: PBL;PAD ; teaching innovation.

1. Introduction

The sudden outbreak of COVID-19 in early 2020 forced offline teaching to online, forcing teachers and students to explore the way to integrate the advantages of online teaching with offline teaching, complement each other, and respond to the challenges and opportunities of the new environment and new technologies. Although the forms are different, the core teaching concepts and challenges of online and offline teaching are similar, that is, how to design and implement the teaching experience around the teaching objectives of high-level, innovative and challenging.

PAD and PBL, as new teaching methods in recent years, provide new ideas and possibilities for the innovation of online and offline teaching mode.PAD is a new teaching model founded by Professor Zhang Xuexin of Fudan University, which divides one lecture into three chronological parts: teacher's presentation, students' dependent assimilation and team discussion[1]. PAD integrates the advantages of professional teachers lecturing and peer discussion which has been proved effectiveness.

Project Based Learning (PBL) is a teaching method in which students learn by actively engaging in real-world and personally meaningful projects.Students work on a project over an extended period of time – from a week up to a semester – that engages them in solving a real-world problem or answering a complex question. They demonstrate their knowledge and skills by creating a public product or presentation for a real audience. As a result, students develop deep content knowledge as well as critical thinking, collaboration, creativity, and communication skills[2].

In essence, PAD is the process of teaching organization, and PBL is the method of inquiry learning. They have similar theoretical basis of emphasizing the students' participation in class and team cooperative learning. Therefore, there is a possibility of the integration of PAD and PBL. However, the research on the integration of PAD and PBL is still very few, and mostly concentrated on medical teaching. Based on this, this study will systematically explore how to embed PBL into PAD online and offline, and adjust PAD based on the gold standard of PBL, which will help to further tap the advantages of the two.

2. The Innovated Teaching System

In the development of curriculum development, the teaching team have been adhering to the paradigm of "problems-plan-implementation-reflection" to conduct educational action research and alliteratively optimize the next cycle of teaching practice.After three years of iteration and reflection of teaching practice, our team have innovated a P-PAD-L teaching system of "1 body, 2 wings, 3

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steps and 4D feedback" : 1 body means PBL and PAD integration, 2 wings are online and offline classrooms, 3 teaching steps include teacher' presentation, students assimilation, discussion and dialogue, 4D feedback comes from learning process and results, self-evaluation and peer evaluation, as shown in Figure 1 below.

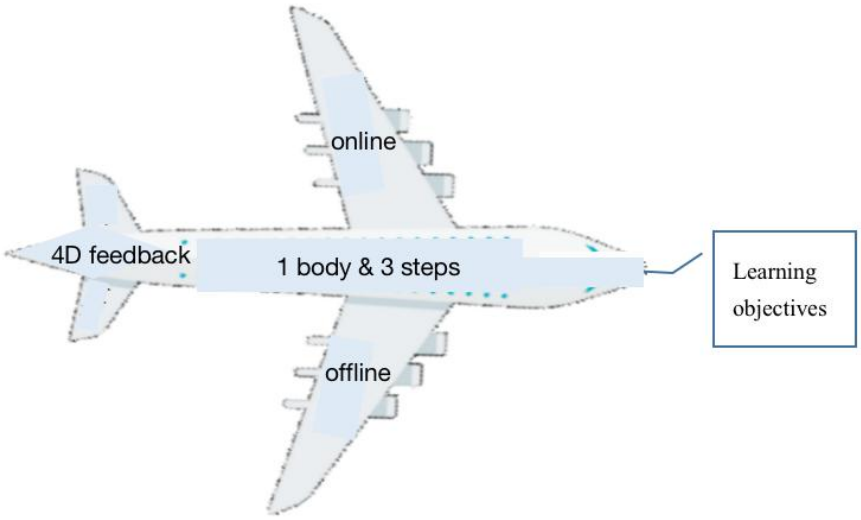

Fig. 1 P-PAD-L teaching system of "1 body, 2 wings, 3 steps and 4D feedback"

2.1 Body: the hybrid of PBL and PAD based on teaching objectives

Learning objectives guide the hybrid of PBL and PAD teaching mode. Bloom's taxonomy identified three categories of educational activities[3]: ①cognitive: mental skills (knowledge); ② psychomotor:manual skills (skills);③affective: growth in feelings or emotional areas (attitude), which is a useful framework for teachers to design the learning objectives.

In order to demonstrate the relationship between learning objectives and P-PAD-L conveniently, the three kinds of learning objectives are represented by the letters O1, O2 and O3. And P1,A1,D1 are for presentation, assimilation and discussion in PAD; P2, B2 and L2 for project based learning in PBL.Figure 2 illustrates the way of hybrid of PBL and PAD to achieve the three kinds of learning objectives, which will be explained in the following three chronological steps in details.

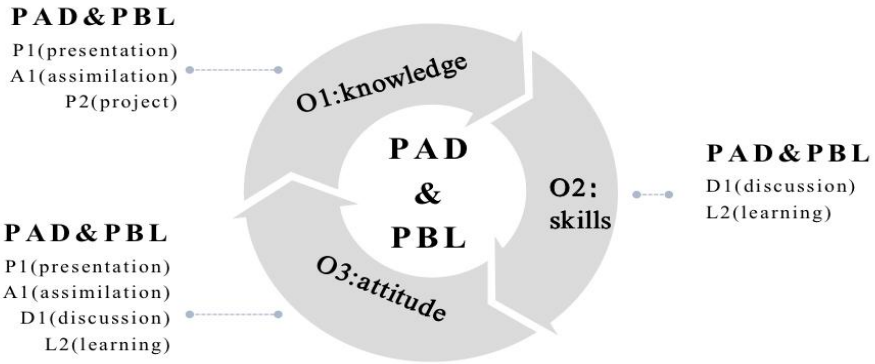

Figure. 2 The connection of the hybrid of PBL and PAD based on learning objectives

2.2 Steps in the hybrid of PBL and PAD

The implementation of hybrid of PAD and PBL named P-PAD-L needs 3 chronological steps or parts in one or more classes. As shown in Figure 3, firstly the teacher should present the framework and main contents, introduce the projects to be explored(P2), illustrate necessary "scaffolding" theories and methods required to carry out the project(P1).Then, students would assimilate(A1) and explore the project(P2) independently and quietly.In the third part, students would discuss (D1)and

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learn (L2)with his or her team mates to finish the project, and publish their works to the whole class.

Generally speaking, P-PAD-L in one class is suitable for less complex topics; P-PAD-L in two or more classes is suitable for challenging projects,which could allow students to have more time to think and design their project.

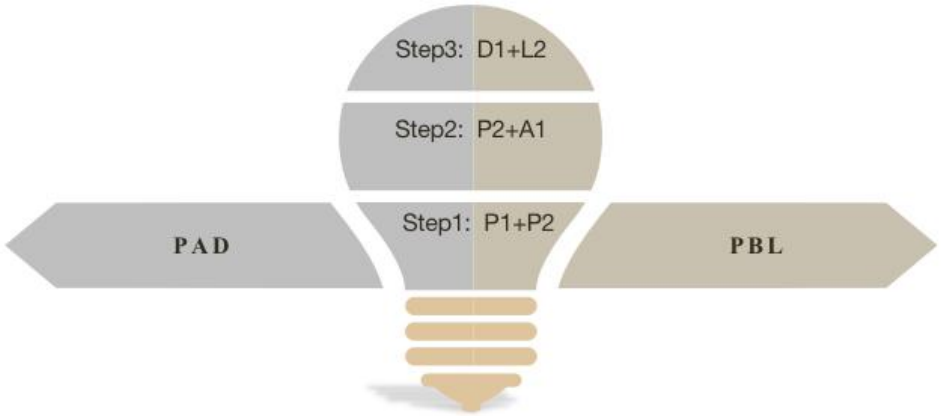

Figure.3 Steps in the hybrid of PBL and PAD

2.3 Two wings: online and offline classes

The two wings of the teaching innovation system refers to online and offline classrooms in the form of SPOC（Small Private Online Course）. Based on the teaching objectives, teachers design the online and offline teaching arrangements according to the teaching content and online and offline classroom characteristics. Before class, teachers will supply learning materials online for students to preview, and survey the students' preparation and interests on the topic will be learned.During the offline class, teachers will follow the 3 steps in the hybrid of PBL and PAD named P-PAD-L to organize the students to learn and finish the project. After class, teachers will provide supplementary learning resources online,and answer questions from students to give them support in the implementation of the project.

Moreover, with the improvement of the technology, teachers can explore more functions of the online classroom, and form a standard manual for online learning to improve teaching efficiency, increase teacher-student interaction, intelligently track students' learning dynamically, and realize the multiplier effect of online and offline classroom integration.

2.4 Assessment directions for students

The assessments direction of the teaching innovation system balance the process evaluation and result evaluation, students' self-evaluation, reflection and peer evaluation. Clear and strict online and offline learning assessment standards are necessary, and feedback from the learning process should be timely, specific and understandable.

3. The feedback from the teaching innovation

The teaching innovation practices foster the growth of students and teachers, which has been recognized by the supervisors and other teachers.

For the students, the P-PAD-L teaching innovation system promotes the transformation of students' learning style, and each student was very satisfied with the learning experience led by P-PAD-L. In order to get more scientific feedback, the research team conducted a controlled experiment for the P-PAD-L teaching reform project in 2021. The questionnaire adopted the "students' experiences of PBL: Journal and questions analysis" compiled by Moore[4], including five dimensions: learning motivation, learning strategy, learning attitude, learning expectation and

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learning atmosphere. The comparative data of 91 students in the experimental group and 107 students in the control group before and after the project show that there are significant differences in teaching content and teachers' role between the two groups.

Table 1 Differences in teaching effectiveness between the experimental and the control group

Item	M(experimental group)	M(control group)	T-value	P-value
Let me learn from my classmates and peers.	3.69	3.98	-2.65	0.01*
The teacher doesn't tell me the answer; rather he/she shows me how to find the answers for myself.	4.05	4.29	-2.324	0.023*

Note:*P<0.05

As shown in Table 1, the students in the experimental group prefer to learn from peer discussion after experiencing the P-PAD-L teaching innovation system. In terms of the role of teachers, there is a significant difference between the experimental group and the control group, t-2.324 (P = 0.023 < 0.05), indicating that students prefer their teachers not only teach knowledge and experience, but should act as a guide to help students develop their thinking and logic.

4. Summary

The research team combine PBL and PAD to an overall P-PAD-L teaching system "1 body, 2 wings, 3 steps and 4D feedback". The feedback form the teaching innovation has been successively reflected and confirmed in student development and curriculum construction deepening.

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