Connecting the Reality–PBL Teaching Design of Course
“Preliminary Architectural Design”

Jialing Xu

Zhejiang University Ningbo Institute of Technology, Ningbo, 315000, China

Abstract. After 8 years of teaching practice, we find the limitations of traditional teaching and think about effective teaching methods. The course "preliminary architectural design" is designed with the teaching goal of "connecting the reality". Learners need to face real people on a real site, and use real materials to build real works, which need to be tested by the public. This paper records the whole process of this small-scale real project, and reflects on the problems in the course. It is found that the curriculum design based on the real world is complex and changeable, and the uncertain teaching content corresponds to the possible recurrent teaching process. However, as long as teachers grasp the curriculum goal of "connection" and "reality," they can make further progress in effective teaching.

Keywords: connection, real construction, curriculum design

1. The Deficiency of Traditional Teaching

In Victor Papanek’s masterpiece “Design For the Real World”, he pointed out that traditional design education had been out of touch with the times. He believes that learning should be pervasive in all aspects of life, understood in real life, applied and reconstructed by learners, so as to internalize the knowledge learned into a source that can creatively expand other knowledge.[1]

There is an obvious disconnection between theory and practice in traditional design teaching: Learners spend a lot of time to learn the theoretical knowledge related to this course first. In the process of leaping from theory to practice, knowledge is quickly forgotten because it is difficult to understand intuitively. When it is required to design according to the assignment, it is often difficult for learners to relate the knowledge they have learned to the design project, which is even more difficult to flexibly apply. At the same time, it is very common to do the real questions in a fake way: Although the design site is real, there is no real “owner,” no need to consider the personalized needs, the feasibility of materials, budget constraints, as long as the design specifications are met, everything can be imagined. The efficiency of learning from the real world is low or even invalid. When learners enter the work position, they need to face the complex and changeable people and things in the real world, they become at a loss. The reasons are caused by many shortcomings of traditional teaching.

First, learning is far away from real life. Learners are unable to get in touch with the real environment and materials, there is a lack of rational cognition on space and scale, teaching content cannot effectively open up the channel between learners and society, and learners' practical ability is insufficient. Second, a lack of initiative in learning. Because of the disconnection between subject knowledge, learners do not know the purpose and significance of learning, the completion of homework has become the fundamental purpose of learning. Third, the systematic training of creative thinking and critical thinking is insufficient. Creative thinking and critical thinking are developed in the process of discovering problems and solving problems. Because of the disconnection between theory and practice, learners are unable to flexibly apply theories in practice, which makes it more difficult for learners to have the opportunity to creatively solve problems. Fourth, the team awareness of learners is insufficient and the work efficiency is low. Learners will face a collaborative society in the future, and good team cooperation ability is the key factor to cultivate leadership. These problems are not only the profound problems in the innovation education of colleges and universities, but also the problems this teaching design tries to solve.
2. Problem-Based Learning Based on Real Projects

With the development of the times, the social environment is constantly changing, learners may face unpredictable difficulties and challenges after graduation. Single learning cannot adapt to the complexity and diversity of knowledge. In response to this trend, American research universities have transformed their training objectives from comprehensive development to innovation. PBL is regarded as the most effective teaching method to help learners develop innovative ability and practical skills, which is helpful to cultivate learners' creative thinking, comprehensive analysis, independent learning and practical problem solving abilities. In addition, it can also cultivate the ability of team cooperation and organization coordination. As a result, it is widely used in various levels of higher education to promote the reform of American higher education.

There is no single authoritative definition of PBL in the field of education, and there are two interpretations of PBL's. P: Problem and Project. Problem-based learning is problem oriented learning, while project-based learning is project oriented learning. Although there is no accepted standard model, the Canadian medical institute's PBL teaching method integrated three learning objectives at the very beginning: how to understand human and society, the medical profession and its social functions, and how to learn by oneself. Instead of focusing on knowledge points, it focuses on interdisciplinary comprehensive learning to improve learners' ability to analyze and solve problems, and puts more emphasis on group cooperation. In PBL teaching, knowledge is acquired through the process of understanding and solving problems. Problems encountered at the beginning of learning will promote the application of problem-solving and reasoning skills, and also stimulate learners' ability to find information by themselves. In this process, learners not only gain knowledge, but also learn about the structure of a problem, and learn the methods to solve the problem.

In this course, the curriculum goal of "connecting the reality" is formulated, which is a new experimental course to explore the reality. Learners need to observe how the elderly gather in a crowded environment to interact and how the activities take place. Teachers encourage learners to sort out and organize their thoughts from the needs of the elderly, and design an activity space for the elderly in the community to have a rest and enjoy. Teachers also encourage learners to create a space with a positive sense of place, so as to enhance the vitality of the community. At the beginning of the project, clear requirements are put forward for the real construction of materials. Bamboo is a natural construction material with the widest coverage area and the lowest cost in Zhejiang Province. At the same time, through the design and research of the previous courses, it is found that the elderly in the community lack an outdoor facility for rainy weather activities, so the course project is proposed to design and build a bamboo pavilion for the elderly. The most difficult problem facing the project is how to make learners with weak design foundation and no experience in construction understand the materials and construction principles. Course tasks continue to revolve around “what,” “why,” “how.” First, learners need to conduct a large amount of literature review on the original bamboo materials to understand the construction characteristics of bamboo materials. Then, the learners conduct a field survey of He Louxuan in Fangta Garden, Songjiang District, Shanghai. They perceive the intention of the design through their bodies and understand the problem of the design. Third, learners need to solve the problem of architectural practice implementation, “how to do;” reflect on "what" and "why" and contemplate a comprehensive practical application.

3. The Teaching Process of Connecting the Reality

3.1 Curriculum Framework

Under the teaching goal of “connecting the reality,” the effective teaching method is based on science inquiry. Therefore, the teaching starting point of "preliminary architectural design" has changed from "thinking design" to “observation and investigation,” and the teaching results have changed from drawing to constructing. The course is obviously experimental, the teaching process
is full of uncertainty, and the final results are interfered by many factors. Teaching has gone through six stages: Topic Selection, Design, Construction, Display, Evaluation and Feedback.[3]

Topic Selection: The topic of building a pavilion for the elderly in the community is the result of the previous course research. In the first class, the teacher announced the teaching goal of the real construction. In the course of studying bamboo properties, the teacher raised the question why large modern buildings rarely use bamboo as building materials. Then, different groups carried out investigations and made equal proportions of bamboo nodes. Different groups used binding, drilling and other methods to connect the bamboo. The difference and limitation of connection methods led to the difference of schemes, and the topic selection affected the design results to a certain extent.

3.2 Design

Learners need to understand the relevant concepts of pavilion design, design separately, and make a 1:30 model with model materials. Then, 3 schemes are selected from 31 schemes, to use bamboo to make a large model of 1:5. After the selection of the expert team, the final scheme is not the equal scale amplification of any one of the 3 schemes, but the design form of one roof truss in the 1:30 scheme and the connection mode of bamboo in the 1:5 scheme. On the surface, there is a backward trend in teaching, but in fact, it is a performance of the spiral rise in PBL teaching.

3.3 Construction

After the completion of the design, the scheme was first built in the school workshop. Starting by familiarizing with the cutting tools and then experimenting with the connection of 1:1 original bamboo. At the beginning, the method of drilling and reconnecting was adopted. However, when connecting, it was found that this method had a large error, and a column composed of four bamboos was barely connected, which caused serious dislocation due to the hole misalignment. Based on the analysis and summary of experience, the problem was solved by using the first bamboo to drill holes in advance, and then directly drilling holes after the neighboring bamboo was close together.

3.4 Display

After construction completion, the bamboo pavilion was removed and packed into the professional exhibition hall for an exhibit, and the learners discussed the node structure which was convenient for disassembly and reassembly. At this point, learners who had been confused before finally understood the meaning of node construction. At the same time, learners found that the inconsistent packaging numbering rules made it time-consuming to find bamboo for the second construction, and proposed corresponding solutions in the later reflection.

3.5 Evaluation

Under the goal of “connecting the reality,” the mutual evaluation among learners will become an important part of curriculum evaluation. The teacher will send the evaluation standard to the learners in advance, so that the learners can make a comprehensive evaluation of their own learning and their group members' learning in two different stages, according to the evaluation standard, which shows the process of teaching to the greatest extent.

3.6 Feedback

Learning is a process that needs to be understood through its elements and its principles constantly practiced. The ability to store, retrieve and use information in long-term memory largely depends on how we learn information. Compared with how much we learn, output is more important in the course. Teachers require learners to record the progress of the course in groups before the beginning of the course. After the end of the course, teachers also require learners to reflect on the questions before and during the course, so as to enhance the effectiveness of learning.
3.7 Process Management

In order to avoid ineffective learning in the process of the project implementation, the teaching sets up the project content that the learner independently designs a bamboo pavilion scheme. Learners should understand the historical origin and construction of a pavilion and design with the special properties of bamboo. The actual bamboo pavilion went through iterations from 31 to 3 to 1. In this process, teachers made the overall schedule according to the teaching calendar, and learners decided the time of each link by themselves according to each group. There was still nearly two months between the end of the course and the start of the exhibition. In addition to making the homework for this course, learners also need to do homework for other courses at the same time. The process lagged behind the plan, but the learners mobilized their subjective initiative and took the initiative to join the real construction and exhibition design.

3.8 Team Organization

The course went through two groupings. The first design group divided the class into three groups. The purpose of grouping at this stage was to gather strength for preliminary research and to become familiar with the working methods of teamwork. The second grouping was based on the type of work, and the purpose was to implement the construction plan. Teachers announced the work responsibilities and time requirements of each group in advance. Learners would choose to enter the corresponding group according to their own preferences and content. There were plan drawing groups responsible for modifying the plan, design and typesetting groups responsible for the display board and text design in the display link, and logistics groups responsible for coordinating the work among members of each group, formulating budget tables, and purchasing, setting up and dismantling. There was a construction team of the bamboo pavilion in the workshop and exhibition hall. There was also a data organization group that tracked all work processes throughout the process and was responsible for text, image and video recording.

4. Problems and Reflections

4.1 Teaching Goals

The course integrates the subject knowledge of environmental psychology, environmental behavior, architecture design, structural design, display design, etc., and organizes curriculum teaching by asking questions to guide learners to think and self-learn, which is the teacher's "connection" discipline. It's challenging to change the focus of the course from design to construction. This goal relates learning to real life and teaches abstract design concepts through the construction of real environments, real people, and real materials. Due to the limitations of materials, tools, equipment, technology and other factors, the established curriculum content will be adjusted according to the actual situation, and the emotional factors of anxiety will be generated, but the learners can overcome the difficulties and solve the problems creatively through continuous self-learning. In the context of connected learning and exploration of the real world, learners acquire autonomous learning methods, try to solve problems creatively, and stimulate changes in cognitive abilities and mental structures.

4.2 Team Cooperation

First of all, it is necessary to help learners understand the meaning of teamwork and its restrictive mechanism. Teachers show a clear task list in advance, and learners enter different groups to complete corresponding tasks according to their respective work content. The content, rules, and tasks in team collaboration are the basis of team collaboration. Only learners who fully understand the team's goals and tasks can use this as a basis to selectively enter the corresponding team to complete the task, give full play to everyone's subjective initiative, and avoid neglecting learners' personality traits.
Second, practice and improving collaboration are better than completing a perfect task. In teamwork, members experienced several stages of adaptation, confrontation, overcoming confrontation, and task completion. College students' conflicts in learning appear in a hidden way, and they often change from learning to daily life, which is difficult for teachers to detect. Therefore, teachers should comprehensively consider the personality characteristics of each team member in the process of promoting team collaboration, and tactics to deal with problems that occur during collaboration. Teachers should emphasize good qualities such as self-control, punctuality, and strong listening skills. Teaches should also emphasize facing the real world with a professional spirit and confronting conflicts with a positive attitude.

4.3 Evaluation and Feedback

"Formal evaluation" is an indirect reflection of the teaching process, and its evaluation comes from public evaluation maps at different stages of the course. Public evaluation plans connect learners, schools, and owners to let learners understand the different perspectives of different people on the same thing, and understand the design evaluation standards to a certain extent.[4] The evaluation opinions formed at each stage are immediate feedback on learning and promote continuous improvement of the project. As the design content continues to be enriched and the evaluation is increasingly complex, the core point of view is removed from the evaluation system to modify the design scheme, so that learners provide important reference opinions for revising and improving the project.

In “formal evaluation,” a set of clear and quantifiable learning quality assessment standards are provided as the basis for learners' self-evaluation and mutual assessment. Teachers observe the learning effect and learning process of learners according to this standard. Judging from the final score evaluation, the results of learner self-evaluation and mutual evaluation basically show the learning status of the learners, and the learner evaluation is essentially consistent with the situation observed by the teacher. As long as it is within a reasonable range, the phenomenon of mutual evaluation mixed with personal emotions is still accepted by teachers, because it is normal for people's evaluation to be disturbed by many factors in reality, and we should believe in the role of hard work, listening and communication, constant thinking and iteration.

Reflection and feedback are the missing parts of traditional teaching. A dull score won by learners can’t prove their mastery of learning enough. Real learning comes from the reflection of experience. Learners can know their learning achievements by recording this feedback in the past and adjust their learning methods in time. Self-reflection contributes to real ability, to promote. At the same time, teachers also improve the teaching content by following up the teaching effect and the implementation of each stage.

5. Conclusion

Authenticity is the core basis for the implementation of PBL teaching method. This teaching is based on the teaching practice of the real community. The theme of the exhibition is to pay attention to the elderly in the community and respond to the aging problem. The complexity and diversity of the reality make the teaching content uncertain, and the teaching process is repeated to a certain extent, which opens the window for learners to face the reality in the study of this subject. Teachers and students should continuously reflect on teaching content, teaching methods, summing up thinking, and gathering results. Finally, allowing teaching to be extended, the exploration of reality will start with this.

References

[1]. Victor·Papanek. Design for the real world. Beijing: CITIC Press. 2013.01.p.295.
[2]. Samy Azer. The fingerpost for Project-Based Lerning (PBL). Beijing: Peking University Medical Press. 2012.p.7.
[3]. Buck Institute for Education (BIE), Xiaomei Zuo. A guide to Standards-Focused Project Based Learning for Middle and High School Teachers. Beijing: Educational Science Publishing House. 2015.

[4]. Buck Institute for Education (BIE), Xiaomei Zuo. A guide to Standards-Focused Project Based Learning for Middle and High School Teachers. Beijing: Educational Science Publishing House. 2015.