

# Research on the Teaching Reform of Environmental Design Course Based on the PBL Teaching Approach

## A Case Lesson of Model Making\*

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**Abstract**—This paper studies and discusses the introduction of the Problem-Based Learning (PBL) into the model making course, and expounds its application and implementation in the teaching process in combination with the current situation of the course, teaching objectives and the procedure of the PBL teaching approach. In terms of the content of the course, it is proposed to integrate the curriculum by the module. Students are guided to complete the modules in groups. It can not only effectively get students involved in the teaching system so as to make the transformation from two-dimensional thinking to three-dimensional thinking, but also enable students to become innovative talents through teamwork, independent learning and practical training.

**Keywords**—*model making; PBL teaching approach; teaching practice*

### I. INTRODUCTION

Colleges and universities have the social service function of cultivating talents for social economy and cultural construction. The development of economy is increasingly demanding innovative and entrepreneurial talents. The design art profession should cultivate innovative and applied talents to face the higher demands of society for talents. The cultivation of talents is inseparable from the development of innovative education methods. As a practical and comprehensive cross-composite subject, the design art major can not meet the demand for talent cultivation. This paper uses the "PBL" teaching method to reconstruct the model making course and analyze its application practice process in the course, in order to study the new teaching mode in teaching to improve the teaching quality, and to promote the development of students' creative thinking and the cultivation of innovative talents.

### II. COURSE STATUS

The Model Making course is a compulsory course for

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environmental design students. It is also a comprehensive course with both theory and practice. It transforms flat drawings into real, three-dimensional models, assisting architecture, landscape, garden and other related majors. The model making course is one of the important means of training students' thinking ability and hand-brain coordination ability [1]. However, in the past teaching, the one-sided emphasis was on the production effect and visual effect of the model, focusing on the "display model" rather than the "study model". This method has the problems of ignoring the spatial thinking ability, the rigid teaching method, and the lack of students' innovative ability. It also leads to the separation of the model making course from other design courses. In the subsequent design courses, the model cannot be used for design analysis. It is difficult to cultivate students' practical and creative design skills.

### III. PBL TEACHING PHILOSOPHY

Project-based teaching method is also called Project Based Learning, and the English abbreviation is "PBL". It is a teaching method based on students-oriented and teachers as the guide. Students' recognition can make them to that when they encounter problems in the project, they can analyze the problem independently, and form a learning method that the student team can jointly create solutions, implement actions and produce reasonable learning methods [2]. The implementation of the "PBL" teaching method is divided into four stages, namely, proposing questions, analyzing problems, solving problems and summarizing evaluations [3]. The advantage of the teaching model is that on the one hand, the curriculum is no longer just a carrier of a specific knowledge system, but becoming a development process for teachers and students to explore new knowledge together, from "passive learning" to "active creation"; on the other hand, it emphasizes the training of skills while focusing on thinking training, cultivating students' ability to acquire knowledge actively, designing artistic practice ability and innovation ability, which is in line with the current social development and industrial development ability of design professionals.

#### IV. REFORM PRACTICE OF MODEL MAKING COURSE REFORM BASED ON PBL TEACHING METHOD

##### A. *Teaching Objectives*

The environmental art design professional model making course is set up in the second semester of the sophomore year. From the perspective of the entire teaching system, model production can be said to run through all the main design courses, such as interior design, landscape design, graduation design, etc. And it plays an important role in the final design research and display. The teaching goal of the model making course is not only to let the students complete a course assignment, but to study and analyze the students' understanding of the shape, structure, function and scale of the space through the research and analysis of the production process, and use the model to carry on the conception, deliberation, research and performance design. Therefore, the teaching content should focus on training students' three-dimensional spatial thinking ability and three-dimensional visual judgment ability, and improve students' comprehensive qualities such as spatial thinking, material properties, processing technology and three-dimensional performance.

##### B. *Teaching Practice of PBL Teaching Method*

1) *Teaching method*: The "PBL" teaching method is integrated into the teaching method of the model making course, which aims to integrate students into the process of meaningful task completion, allowing students to actively learn and construct knowledge independently [4]. The teacher's transformation of the one-way teaching mode has led to the guidance of students to actively explore the course content, which is embodied in the following: the teaching content is constructed by the teacher, and the group activities are carried out by grouping the students (3-5 groups) and selecting the team leader to start the course activities. Team members use basic tools and technical knowledge to learn, self-manage curriculum activities, and discuss each other's effective and creative completion of the course content. In addition, during the teaching process, teachers encourage students to study independently, think independently and solve problems, and report the progress of the project to teachers in time to better conduct course management and targeted guidance.

2) *Curriculum module design*: Project-based teaching involves a wide range of knowledge and uneven distribution of knowledge points. In some projects, it is impossible to cover all the knowledge points specified in the outline, and the depth is not enough. Therefore, in the implementation of

project-based teaching, its characteristics must be clearly understood and blind copying should be avoided [5]. Therefore, on the basis of comprehensive consideration of the syllabus, teaching knowledge, course time and difficulty level, the teaching content is developed in the form of a course module, and the students complete four course modules in groups. Each module is planned and implemented by the students themselves. The content of the course module includes the following four parts (see "Fig. 1"):

- The first is the selection of course topic, which is divided into two situations: one is the teacher's choice of the topic; the selection takes into account that the course time is only four weeks, and it is necessary to make two models. The case works of the classic architectural masters (Barcelona German Pavilion, Ando Tadao's Church of the Light) are provided for students to choose one. The other is that the students choose their own topics. This situation needs to be reviewed by the teacher. The auditing standards are whether they meet the training objectives of the course and whether they can be completed within the course time.
- The second is the temporal arrangement, which requires students to complete the corresponding content according to the schedule.
- The third is the curriculum content, that is, the course assignment, the students complete two model works in the course: one is a masterpiece research model, which requires the use of a single material; the other is the material creative use model, and the choice of materials is not limited. The first topic focuses on spatial relationship analysis. The purpose is to enable students to understand the design concepts of the master's classic works, as well as the related architectural drawings such as plan, elevation and section drawings of the design, and thus the ability to read the drawings. The second topic focuses on material usage analysis. The purpose is to enable students to use design concepts, material ideas and detailed design to complete models with certain design styles, emphasizing design style, visual relationship, and overall sense.
- The fourth is the specific content, the development of tasks to help students sort out the content of the subject, is conducive to students to grasp the progress of the project, the practice activities before and after the class.

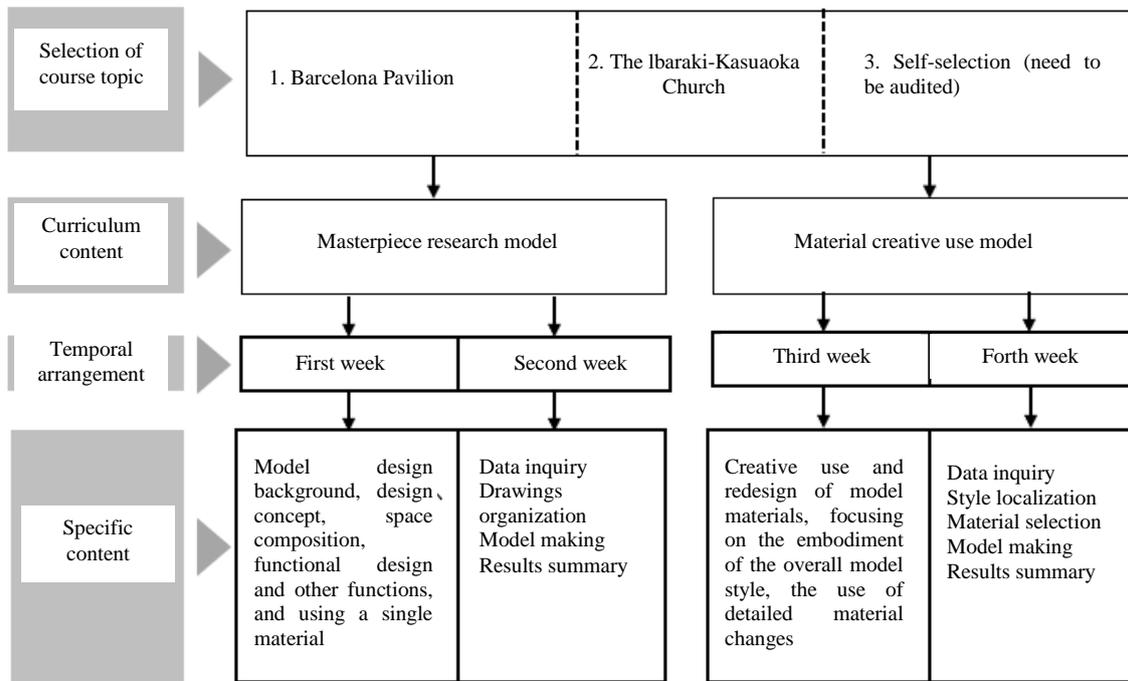


Fig. 1. Schematic diagram of the curriculum module.

C. Teaching Implementation Process

1) *Theoretical teaching stage:* The teaching part of the course theory is indispensable. The content of the lecture contains three aspects: the first is the basic concept and production content of the model, the second is the use of common materials and tools of the model, and the third is the design process and creative concept of the model making. The purpose is to enable students to master the content and procedures of model making by learning theoretical knowledge, thus establishing a basic knowledge system.

2) *Self-learning stage:* First of all, students determine the content of the topic according to the capabilities of each group, and independently query the program materials of the selected topic such as the design background, design concept and plan drawings, so that students can deeply understand the design, size, shape relationship and other content, and the teacher will check the correctness of the information. For the sophomore students, although the previous three-dimensional curriculum has cultivated students' three-dimensional spatial perception ability to a certain extent, most students still feel that reading pictures is difficult. Therefore, from the two-dimensional plan, elevation and section map through the proportional scaling into a three-dimensional space, students need to observe from multiple angles, and compare and think the three-dimensional shape and spatial relationship, and finally understand the program clearly.

Then, before the model is started, students need to be familiar with the various materials and the use characteristics of the tools. It is advocated to use easy-to-process, low-cost, textured materials. It is recommended that on the one hand students can choose conventional model materials such as PVC board, acrylic board, blockboard, etc., and on the other hand, students are required to select the appropriate materials according to the style of the work, and students are also encouraged to make a variety of materials, and creatively rework their shapes and textures, such as toothpicks, wood chips, foam, etc. Students should repeatedly compare and scrutinize materials before the model is started, explore different ways of expressing materials, and strengthen students' creative research ability and practical ability.

At this stage, after the students are grouped, they will make their own task plans, clearly define the division of labor and work together to solve the problems in production, and cultivate the ability of teamwork, communication and management of students. The teachers will guide the situation of each group, analyze the problems and difficulties in the task, and establish a mode of cooperation between teachers and students.

3) *Production implementation stage:* The premise of model production is that students should master the methods and steps of the model making. In order to avoid missing details or consensus issues in the model making process, through the supplementation of case teaching, such as outstanding works, award-winning works, and corporate cases, it is beneficial to stimulate students' creativity and avoid detours during production.

In the first and second week of training in the curriculum module setting, after the training of studying and analyzing model, the students basically mastered the use of the tools and the ability to read pictures, and the ability to query the data, which has laid a certain foundation for the production of the third and fourth material creative use models. It not only can the three-dimensional construction of flat, elevation and detail be more skillfully constructed, but also the style matching, detailing and processing of different materials between materials and materials can be conducted better innovation use. Furthermore, the production of the model basically needs to be modified several times. Some students will repeatedly refine and compare the materials and shapes during the production, and even re-modify the model so that the model style is unified as a whole. This situation is a good reinforcement of students' observation, creativity and teamwork skills.

4) *Exchanging report stage*: Setting up a phased communication report during the implementation of the teaching is conducive to solving the problems in the process of self-learning, sorting out the production ideas and thinking about the subsequent refinement. In the process of student report and teacher review, the repetition of teaching content deepens students' understanding of knowledge, and especially the collision of different ideas can stimulate better creative inspiration. In the teaching process of model making, the exchange report is divided into two stages: the first is to report on the design concept, spatial function, site relationship, and problem solving methods after completing the research and analysis model of famous works; the second is that, after completing the material creative model, the design of the model style, the application of the materials, the detailed processing and the production plan are reported. In this process, students receive mutual evaluations, teacher evaluations, motivating learning initiatives, and healthy competition between groups.

#### *D. Results and Evaluation*

Through the study of the course, students master the methods and steps of model making, and lay the foundation for the professional study of other courses, and also exercise the students' thinking ability. After the model is completed, students are required to use different forms of summaries to report the results of each group. The final results encourage students to display diversely, such as the shooting of the student model, the design process, the PPT production, the entry of the work, and the software and hardware display on the WeChat platform, etc. At the same time, students receive evaluations from different groups of people to reflect on the strengths and weaknesses of the course, in order to develop students' ability to sum up experience.

In summary, the "PBL" teaching method runs through the teaching practice stage of the model making course, which can guide students to actively explore the relevant conceptual principles in the professional field, improve the ability to solve problems and creative thinking ability, and finally enhance students' practical ability.

## V. CONCLUSION

The "PBL" teaching mode has certain innovation and practicality, especially in practice teaching. It can fully mobilize students to participate in the learning process, realize the understanding and grasp of knowledge in the process of solving practical problems, cultivate students' ability to think and solve problems independently, and enhance students' sense of teamwork [6]. For the teaching effect of the model making course, it should not only aim at completing the coursework, but design and produce the students' spatial thinking and design practice ability, so as to achieve the teaching goal of cultivating students' comprehensive design ability, and at the same time, it is in line with the current social development and industrial development needs of design professionals.

## REFERENCES

- [1] Wang Xiaole, Discussion on the Teaching Mode of Model Making Under the Influence of Spatial Thinking [J] *Art and Literature for the Masses*, 2015 (18): 240-241. (in Chinese)
- [2] R. Capraro, *Project-Based Learning* [M]. Sense Publishers, 2009.
- [3] Liu Yadi, Zheng Jing, Research on the Application of "PBL" Teaching Method to the Teaching of Furniture Design [J] *Furniture & Interior Design*, 2017 (10). (in Chinese)
- [4] Leng Shujun, Exploration and Practice on Project Teaching Method [J] *Jiangxi Educational Research*, 2007 (7): 119-120. (in Chinese)
- [5] Zhang Weiwei, How to Use Project System in Design Teaching [J] *Journal of Nanjing Arts Institute Fine Arts & Design*, 2010 (4): 149-150. (in Chinese)
- [6] Wang Xiaojun, The Construction and Practice of PBL Teaching Mode — Taking the Art Design Major as an Example [J] *Journal of Guangxi University Wuzhou Branch*, 2016, 26 (6): 89-93. (in Chinese)