

Analysis on the Cultivation of Design Thinking Logic in the Pedagogical Reform of Plane Composition of Product Design Major

Lijuan Xiong¹ Xiujun Zhang^{2,*}

¹ School of Fine Arts and Design, Chengdu University, Chengdu, China

² School of Computer Science, Chengdu University, Chengdu, China

*Corresponding author. Email: woodszhang@cdu.edu.cn

ABSTRACT

Taking the problems found in the teaching of plane composition of product design as the starting point, this paper studies the training objectives of plane composition of product design major, and further excavates and refines the knowledge points of the course. On this basis, this paper focuses on exploring the method of implanting design thinking logic into the teaching process of plane composition course of product design major. Based on the example of course design, this paper proposes to cultivate the divergence and convergence of students' thinking and demonstrates the feasibility of logical thinking mode. This paper provides concrete examples for teachers' curriculum practice.

Keywords: Product design major, Training objectives, Design thinking, Pedagogical reform.

1. INTRODUCTION

At the New Era National Undergraduate Education Work Conference for Higher Education Institutions held in 2018, the Minister of Education Chen Baosheng proposed: "All universities should comprehensively sort out the teaching content of each course, eliminate the 'water class', create a 'golden class', should reasonably increase the degree of academic challenge, increase the difficulty of courses, expand the depth of courses, and effectively improve the quality of course teaching." [1] Graphic composition has always been used as a basic course for design majors. Chengdu University proposes to comprehensively improve the quality of students, enhance the quality of courses, expand the knowledge of courses, and deepen the alignment of courses and professional development plans. The article starts from the problems found in the teaching of graphic composition of the product design major: lack of initiative of students, the separation of curriculum practice from the direction of professional development, emphasis on design practice and less design thinking ability training. Aiming at the actual problems discovered, based on the reasons for the problems, the curriculum training goals and

discipline professional development plans are drawn up, focusing on the divergence and convergence of design thinking and the cultivation of logical design thinking to find breakthroughs.

2. PROBLEMS IN THE TEACHING OF GRAPHIC COMPOSITION COURSES FOR PRODUCT DESIGN MAJOR

In the teaching of product design major, the problems of traditional plane composition teaching method are mainly manifested in the following three aspects: the lack of initiative of students, the separation of course practice and professional development direction, and the emphasis on design performance rather than the training of design thinking.

2.1 The Lack of Initiative of Students in Plane Composition Course

The course of plane composition is the basic course of art design major. This course is offered in the first semester normally, and many public cultural courses are offered at the same time. When

students just enter the school, they are faced with a state of unclear professional development, tight time for schoolwork, and complicated learning content. Due to students' unfamiliarity with professional courses and the basic nature of course content, it is easy to cause students to "contempt". In addition, teachers did not carry out a good extension of the course content during the course of teaching, and they focused on teaching. Students could not find the interest of learning from the study, and they would easily show that they were not active in learning. These require teachers to guide students into the state of professional learning and understand the direction of professional development during the teaching process.

2.2 The Separation of Curriculum Practice from the Direction of Professional Development

The knowledge points of plane composition may seem unremarkable, but they are indispensable for the later professional courses. Traditional teaching is often just the practice of knowledge points and lacks different guidance to the development direction of design major. In addition, more design thinking and design methods are studied in the later professional courses, so that the students neglect the design application of the constituent elements and the constituent methods in the later practice process. As a result, there is not enough interdependence between the depth of the "details" of the design and the theory.

2.3 The Emphasis on Design Performance Rather than the Cultivation of Design Thinking Ability

In traditional teaching, "composition teaching focuses on hand skills training, which is quite time-consuming. In this teaching process, students are basically limited to the combination of several basic shapes and bones, and focus more on the fine drawing of hands, while ignoring more creative thinking about the form,"[2]. Students practice exercises, and the requirements for the fineness of production in teaching grading have once become an important criterion for grading and assessment. This kind of grading method reflects the participation of students and the application of knowledge points to a certain extent, but if it is only a single knowledge point practice, it lacks systematic and expansive learning of knowledge, let alone the opening of design thinking.

The lack of understanding of the curriculum leads to students' lack of initiative, the unclear orientation of the curriculum leads to students' lack of understanding of the systematic knowledge, and the one-sidedness of the curriculum evaluation standards leads to students' neglect of thinking about innovative design. All these can be attributed to the lack of training intensity in the cultivation of students' design thinking logic.

3. THE TRAINING OBJECTIVES AND COMBINING THE KNOWLEDGE POINTS OF THE COURSE OF PLANE COMPOSITION OF PRODUCT DESIGN MAJOR

3.1 The Training Objectives of Plane Composition Curriculum

The training goal of plane composition course mainly includes three aspects: knowledge goal, ability goal and quality goal. The goal of knowledge is to train students to understand the basic form of plane composition and its change form, formation rules and application of formation methods. Master the basic elements of plane composition and form of expression, which is consistent with the direction of product design; The ability objective is to train students to be diligent in thinking and to make full use of the Internet, database and other means in order to devote themselves seriously to the research. Cultivate the students' ability to discover, analyze and solve problems, and also cultivate the students' innovation consciousness, aesthetic quality and teamwork ability. The quality objectives of students mainly include cultivating students' artistic expression, positive theme thoughts, and good language expression. Teachers should make it clear that the course content of plane composition needs to attach importance to the description of knowledge points and the establishment of design thinking logic at the same time, and make it clear that the purpose of teaching is not only to describe knowledge itself, but also to establish a systematic knowledge system based on the their stored knowledge, and guide students to think logically and divergently in the construction process of the system. In order to improve students' ability to analyze and solve problems and consolidate the existing knowledge, teachers need to think about how to bridge and update the old and new knowledge in the teaching method. The key to

problem solving is to establish a thinking mode of systematic analysis of the problem so as to improve the ability to analyze the problem.

3.2 *Combing and Refining the Basic Knowledge of the Course and the Development Direction of Product Design Major*

The knowledge content of the plane composition course mainly covers three parts: the basic elements of composition, the method of composition and the rules of composition. The law of composition is implicit in all forms of composition. Simply speaking about the law of composition will appear pale in content, so the key point of plane composition lies in the study of the basic elements and methods of composition. Clarifying the composition of the knowledge system of plane composition is conducive to refining the content of the course in a limited time. The professional development direction is formulated based on expert opinions, social needs at the current stage, combined with the basic positioning of the school's service area and its own school-running characteristics, and has three design directions for home furnishing, cultural creation, and clothing. In the course of graphic composition, the purpose of implanting the direction of professional development is to help students apply what they have learned on the one hand, and on the other hand, to subtly allow students to understand their professional development direction and plan ahead.

4. STRENGTHENING THE CULTIVATION OF DESIGN THINKING LOGIC IN THE TEACHING OF PLANE COMPOSITION OF PRODUCT DESIGN MAJOR

There are two different types of thinking: one is a rational, a logical process of thinking; The other is an intuitive, an imaginative thought process. These two ways of thinking are called "convergent" and "divergent" respectively. [3] In the teaching of plane composition of product design major, it not only teaches knowledge alone, but also pays more attention to students' knowledge integration, the establishment of knowledge system and the cultivation of independent innovation consciousness. The setting of course content is mainly carried out from three aspects: the

cultivation of divergent design thinking, convergent design thinking and logical design thinking.

4.1 *Cultivation of Divergent Design Thinking*

4.1.1 *Establishing a Tree-like Knowledge Cognition System*

In course narration, the system of tree-like knowledge structure is used to establish the cognitive system of knowledge. By taking the morphological understanding of points as an example, students can expand their understanding from the origin of simple geometric forms to the understanding of relative things, from micro to macro, from single discipline to cross discipline, and from natural form to artificial form. The understanding of the form of points in the course is described by a tree structure diagram, which on the one hand enables students to increase the understanding and divergence of the different dimensions of the form of points in a simple way; on the other hand, it enables students to establish the logical thinking connection between the old and new knowledge systems. Parsing the course content tree is not only helpful for students to better understand the knowledge construction of the course, but also can train students to analyze and observe things from a multi-dimensional logical perspective in the learning process.

4.1.2 *Making Design Conception by Combining Product Design Thinking Methods*

In the teaching process of plane composition, we should abandon the teaching that separates the content of basic courses from the direction of professional development. In the course proposition formulation, we should closely revolve around the school's running purpose, the development characteristics of the school, and the development direction of the discipline, so as to carry on the effective combination. Finally, we try to put 5W2H product design thinking into the subject project. Take the cup and plate combination as an example in the space dimension exercise of plane composition knowledge. In the case of determining the theme, we considered the pattern state of the cup and plate at different times in the process of use: standing — taking — separating the cup and plate — placing. With "Chengdu gift" as the topic of the cup design, based on the folk tale called

"Madame White Snake", and combined it with panda elements, students designed the Sichuan opera face changing cup, which is fully considered the use of the process of clever design. 1) Double cup that can be rotated to form different states of theatrical masks, which reflects the interesting of

such a design; 2) The helmet head pattern is applied to the outer cup and the plate surface, which help to achieve the purpose of unified vision; 3) The design of the panda pattern at the bottom of the cup echoes the combination of inner and outer cups. This is shown in "Figure 1".



Figure 1 Cups and plates with a panda design- Designed by student Li Jiao.

a) The inner cup; b) The outer cup; c) The bottom of the plate; d) The combination of cup and plate

It can promote the divergence of students' design thinking by analyzing the course contents in tree diagram and introducing product design thinking method into the course.

4.2 Cultivation of Convergent Design Thinking

In the course practice stage, the most difficult thing is to start thinking, but after the divergent thinking operation training in the last step, students can consciously diverge their thinking. In order to enable students to quickly enter the design state in a limited time, the SMART principle is used to design the course and draw up a semi-open design proposition.

4.2.1 Incorporating SMART Goal Management Principles into the Curriculum Design Helps to Converge Thinking

The SMART principle is a management by objectives principle, which contains specificity, measurability, achievability, relevance and time-limited. The SMART principle can "help us set goals that are truly effective and reduce the probability of failure." [4] In the total 48 hours of plane composition, teachers need to carry out teaching design, since effective instructional design will help students to converge their design thinking and improve their learning efficiency. The application of SMART principles helps students to clarify the learning content and master the design practice destination. In the learning process, according to the teaching objectives of the teacher's course, students make a summary of the course for a single lesson; In the design practice, students are given clear academic requirements that help them

to plan their time. The application of SMART principles and methods not only improves the learning efficiency of this course, but also helps to improve students' time management and self-management ability.

4.2.2 Putting Semi-open Propositions in the Schoolwork Will Help the Convergence of Design Thinking

With the semi-open proposition to converge the thinking, students can avoid falling into the fantasy, which can help students quickly enter the design innovation stage in a limited time. Students analyze the solved problems, make clear the order of solving problems, and make clear the key points of design performance. The setting of semi-open proposition allows students to create freely, and they can use their existing knowledge or cut into the topic they are interested in to exert their initiative in learning. Curriculum is not only a process of knowledge learning and practice, but also a process of exploration and discovery for students to constantly enrich themselves and get better involved in the course learning.

For example, in the practice of basic elements such as point, line and surface, the proposition was set as "the direction of home -- the design of chair", and the construction of pure point, pure line and pure surface was carried out. On the one hand, we can understand the students' grasp of the basic theory of the transformation between points, lines and planes through training. On the other hand, strengthen students' understanding of home design; Finally, the semi-proposition of chair design is helpful for students to achieve the convergence of thinking in a very limited time.

4.3 Cultivation of Logical Design Thinking

Thinking is the process that the brain ascends to the rational and logical understanding of things from the subconscious and subliminal level. Thinking is based on perception and transcends the boundary of perception. [5] Logical thinking is realized by taking abstract concept, judgment and reasoning as the basic form of thinking, and taking analysis, synthesis, comparison, abstraction, generalization and conformation as the basic process of thinking to reveal the essence and connection of things. [6] The thinking mode of design is both a kind of inertia thinking and a semi-open thinking.

- The logic covered in this course mainly includes the following three aspects: 1) Logical thinking on the evolution of course content. The process is from the understanding of the change of the point to the change of the line, and the change of the plane of thinking expansion; 2) Logical construction of the curriculum system. That is the logical construction of basic courses and professional courses; 3) The establishment of the correlation logic between formation method and design practice. It means that do a good job of teaching combining theory with practice, abandon the emphasis on practice and neglect theory in design art teaching. Teaching creativity should be based on the research of relevant things, and then combing the collected existing knowledge and relevant research methods, so as to form a logical and systematic design thinking in the creation.
- In the course, the cultivation of logical design thinking is mainly improved by writing design instructions, which including integrating theme ideas, digging and applying shapes, colors, modeling and other elements in the design process, applying theoretical design methods, design deduction process, and thinking about the design and production process. By analyzing the subject of the course proposition and clarifying the design project requirements, students can form logical design thinking based on their existing knowledge.

Taking the group of monomorphic knowledge points of the course as an example, and combining it with jewelry design in the direction of professional development, the production requirements are as follows: design with geometric shape and organic form as the basic elements, each

of which is not less than 6; pay attention to the identity of the choice of form; Flexible use of basic form and joint surface formation; pay attention to various attempts of theme ideas, culture and style; draw the presentation effect, which should consider the material texture and color; Write design description (element source, formation method, theme expression, etc.). Students can establish the logic of design thinking by writing design descriptions ("Figure 2").



Figure 2 Strong Youth- A jewelry design work by Student Li Qianxue.

5. CONCLUSION

With the product design in planar formation teaching, this paper explored the training methods of students' divergent and convergent design thinking and logical design thinking. To train students to observe things from a multi-dimensional perspective, analyze things from a rational perspective, and innovate things from a systematic thinking, so as to enable students to better achieve the course objectives and clear the direction of professional development, so as to realize the cultivation of students' multi-dimensional ability.

AUTHORS' CONTRIBUTIONS

Lijuan Xiong is responsible for writing the manuscript, and Xiujun Zhang participates in the revision and editing.

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