

Teaching Reform of "Computer Aided Design" Course for Visual Communication Design Major Based on Systematic Thinking Mode

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Abstract—Based on the teaching characteristics and learning goal requirements of computer aided design course in design subject, this paper analyzes on the practical significance of systematic thinking in the course teaching reform, and introduces how to optimize the course structure and set up the teaching content accurately, and reasonable implementation of effective design teaching means and methods, so as to stimulate students' interest in learning, improve students' application ability and innovation ability.

Keywords—systematic thinking; design teaching; computer aided design; teaching reform

I. INTRODUCTION

With the rapid development of computer science and technology, computer software technology has been widely used in various industries of society because of its powerful digital processing function. In the field of art design, only by mastering the use methods and skills of various graphic and image design software, can we transform the creative ideas and design sketches in our minds into practical works. Therefore, the visual communication design major in various colleges and universities offers the course of computer aided design, which is a compulsory course for the basic specialty, mainly learning CorelDraw, Illustrator, Photoshop, InDesign, Flash and other software, which trains students' ability to use computer digital tools to assist art design, which train students' computer making and design ability in logo design, VI production, poster promotion, font design, packaging design, typesetting printing, advertising image synthesis, special effects production and so on.

II. THE LEARNING GOAL LEVEL REQUIREMENTS OF COMPUTER AIDED DESIGN COURSE

According to the taxonomical theory of teaching objectives in Bloom's cognitive field, the goals in the field of knowledge are divided into six different levels, namely,

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memorization, understanding, application, analysis, evaluation and creation [1]. Among these six levels, memorization and understanding are easier and less difficult; however, the difficulty of applying, analyzing, evaluating and creating these four levels increases step by step. At present, most of the teaching of computer aided design adopts the mode of "teacher explanation tool command-case demonstration-students follow the case operation". After the teacher explains and demonstrates the case through Commands for software tools, students can basically complete the case production on the spot.

However, this kind of operation learning, which is demonstrated first and then imitated, lacks certain initiative for students, and mainly aims at the learning of technical tools, which rarely involves the creativity and design thinking behind the case graphics. According to Bloom's theory of learning goal taxonomy in the field of cognition, most of this situation stays at the level of memorization, understanding and application. However, this goal level is far from enough for the comprehensive practical ability of college students, which should be analyzed, evaluated and recreated step by step on the basis of memorization, understanding and application. The study of computer digital tools is not simple software learning, but should be based on systematic thinking to organize teaching, while learning software operation, strengthen the learning guidance of professional theory and design thinking, which cultivate students' systematic design ability and lay a solid foundation for subsequent professional courses.

According to the talent training scheme and curriculum syllabus of visual communication design major in Huanggang normal University in 2016, combined with the taxonomical theory of teaching objectives in Bloom's cognitive field, the author adjusts the learning objectives of the curriculum ("Fig. 1"), which is divided into three levels:

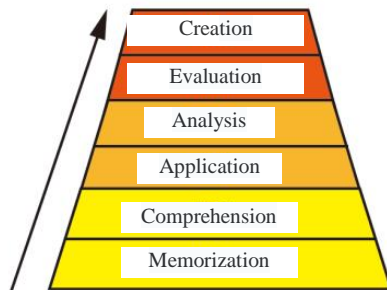
A. The Mastery of Software Technical Commands

This is the basic requirement of course teaching, that is, through the study of the course, we can understand the basic knowledge background of software tools, be familiar with the functions and use skills of the main tools of the software, and master the application skills of each command of the

software. Through the mutual cooperation of tool commands, we can skillfully complete the production of case works.

B. The Analysis and Application of Graphic Form

This means that with the progress of curriculum learning, students are required to have a certain ability of graphic analysis and understanding, a certain degree of design thinking, and the ability to analyze the works in visual design on the basis of being familiar with the commands of software tools. According to the characteristics of its graphics, students analyze the composition of the point and line surface, understands the application of the law of formal



beauty in the works, and preliminarily realize the transformation from technology to method.

C. The Use and Creation of Design Thinking

The technical operation of software tools is not the single training goal of computer aided design course, but the pursuit of integrating the understanding and construction of design thinking into the operation of skills, so that students can understand the knowledge system of the whole specialty, master certain professional design concept and professional thinking ability, have strong comprehensive design ability, and can initially create a certain creative level of application works according to the object goal.

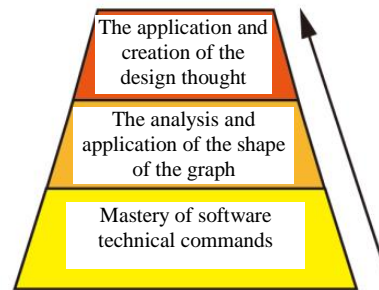


Fig. 1. Six levels of learning goals in the cognitive field of Bloom and three levels of learning objectives in curriculum practice.

III. THE FEASIBILITY OF INTRODUCING SYSTEMATIC THINKING INTO THE COURSE OF COMPUTER AIDED DESIGN

Systematic thinking is a kind of thinking pattern of thinking and looking at things, which is based on the systematic research and development of American scientist Devich von Bertalanfi on biological science organisms. It regards the interdependent whole as the collection of relations and consequences, and its core idea is that the system has diversity, relevance and integrity. It is emphasized that the system is composed of two or more different parts, and the internal elements are related to each other and interact with each other to become an organic unity. It is advocated to look at the various parts of the object from the perspective of connection, focusing on the relationship and interaction between the elements within the system, to understand the part as a whole, and then to synthesize it into the whole [2].

A. It Is Necessary to Construct a Comprehensive Theoretical System of Professional Knowledge Under the Guidance of Systematic Thinking Because of the Intersecting and Integrating Characteristics of the Knowledge Structure System of the Design Discipline

Modern visual design has long developed from the traditional two-dimensional plane to products, display, digital image, Internet, mobile media and other fields, the transmission of information from static to dynamic, from a single to interactive trend. The scope of the study not only includes visual form, color, aesthetics and other artistic aspects, but also involves linguistics, physiology, psychology, philosophy, marketing, informatics and other social sciences,

and set humanities and art and social science and technology as one. In recent years, with the development of Internet mobile media and artificial intelligence technology, visual communication design has shown unprecedented diversification and intersection. According to the idea of systematic thinking, these related subject knowledge can be integrated into a larger environmental system, and a theoretical system of "large design view" can be established. The connection and fusion between design, art and science, or the borrowing of adjacent subject categories, also puts forward new ideas and directions for modern design.

B. The Theoretical Knowledge of Each Course Module in Visual Communication Design Specialty Is Related, Which Needs to Be Guided by Systematic Thinking and Promote the Integration of Curriculum Knowledge Points

The design of each course module in visual communication design, such as packaging and printing, book binding, poster, advertising design, brand design, etc., although they show a variety of forms, the design principle and aesthetic knowledge system are consistent. In addition, according to the cross-integration of modern visual communication, each design is not isolated alone, but contains many design elements, and is related to each other and affects each other. The existence of this relationship is based on systematic thinking to make modern design a specific whole, such as poster design, involving the creative graphics, layout, text design, color and other knowledge of the use. In addition, in the brand planning, the establishment and promotion of a brand cannot be separated from planning, creativity, production, publicity and other links, specifically involving advertising copywriting, thinking creativity, logo

design, font design, multimedia animation, film and television production, Product design, packaging design, poster design, advertising and other professional courses design knowledge.

C. Modern Art Design Is a Systematic Activity, and the Process of Design Has Many Links, So It Is Necessary to Cultivate the Train of Thought to Solve the Problem as a Whole

Design is a creative behavior aimed at a specific goal. The process of design is to analyze all kinds of existing elements and information, carry out creative analysis and creative imagination, and skillfully use design elements to construct a design creativity training system based on the concept of systematic thinking [3].

First of all, we should consider the whole design process as a whole and fully plan and arrange. The general process of design is approximately: investigation — design concept — hand-drawn sketch — analysis discussion — sketch improvement — computer production — discussion modification — finalization. Secondly, every link, we should aim to solve the problem. As the design concept is the key, first analyze the characteristics of the existing elements, and combine the creation according to the essential points of the design, the explosion of the mind in the mind is the operation process of thinking, the hand-drawn sketch is the capture of the moment of inspiration, and has strong creativity and uniqueness. It is also the basis of post-computer production. The computer digital tool, as a technical means, is an effective means and form for the further performance of the design concept and the hand-drawn sketch. Thirdly, in the systematic thinking, the internal and external elements of the system and the connection with the outside are a dynamic process. In the process of design, the external environment of the design will change constantly, and the communication and feedback of the information should be made, and the problems in the design can be found and solved in a dynamic perspective, improve and modify the design plan.

D. The Integration and Diversity of Computer Digital Tool Systems Requires Systematic Thinking to Promote the Docking and Transformation of Knowledge Points

In the course of computer aided design, for CorelDraw, Illustrator, Photoshop, InDesign, Flash and other core design software, according to their own talent training program, most of the colleges and universities choose 2-3 kinds of software to carry out teaching, among which the emphasis may be different. In the actual design practice, most of the software needs to cooperate with each other to complete the design effect. For example, with regard to CorelDraw, Illustrator and Photoshop, the three kinds of software can be used with each other, such as special effects on graphics in Photoshop, and then typesetting in Illustrator or CorelDraw. For example, if a file made in Photoshop, such as "mixed mode with layer" or "layer style", if imported into CorelDraw, the effect of the picture will disappear or change a lot.

Such as hand-drawn an illustration design, the combination of Illustrator and Photoshop is more convenient. The specific operation is: first draw the graph in Illustrator, then select and copy it and then go to Photoshop for paste, and thus it becomes a smart object. The later effect adjustment can be made in Photoshop. If we need to modify the outline of the original graph, we can go back to Illustrator to modify it by double-clicking the graph.

Therefore, combined with the characteristics of the software, we set up the teaching content and case with the concept of systematic thinking, so that there is one that connects with each other before and after between the teaching content, and the teaching cases can be matched and continued with each other. The software technology of the whole curriculum system forms an organic whole, avoids a single teaching island, and constructs a cooperative operation collection.

IV. CARRYING OUT COURSE TEACHING IN COMBINATION WITH THE CONCEPT OF ENGINEERING EDUCATION

In September 2014, with the approval of Hubei Provincial Education Department, Huanggang normal University became one of the first pilot colleges and universities to transform into applied technology-oriented colleges and universities, and the visual communication design major was also established as the first batch of transition and development pilot majors. In the process of construction of applied undergraduate specialty, guided by systematic thinking, a lot of explorations and attempts have been made on personnel training scheme, curriculum system and teaching mode, according to the integrity, intersection of the knowledge system of modern visual communication design specialty and the particularity of computer software technology, from the whole to the part, and from the part to the whole. Carefully design the teaching structure, set up the teaching content, scientifically plan and manage the teaching process.

A. Optimizing the Knowledge Structure of the Course Carefully

Computer aided design (CAD) is a basic design course for visual communication design major in our university. According to the talent training program in 2013, the actual teaching content of this course is divided into two parts: one is computer aided design (CAD) offered in the third semester of the university. The school hours are 48 class hours, the main contents are 32 class hours of CorelDraw and 16 class hours of Photoshop. In addition, Graphic and Image processing in the Fifth semester of undergraduate course, the main content is the advanced operation of Photoshop, learning 32 class hours.

The knowledge structure of the course was readjusted and optimized in 2016 (shown in "Table I"), based on the professional learning basis of our college students, according to the training objectives and subject knowledge system of professional talents, through the comprehensive investigation and demonstration of visual communication design department, In the revised and adjusted talent training

program in 2016, the curriculum of computer aided design (CAD) is set as "3+3" mode, that is, the study of three stages and three modules, the three stages are the study of CorelDraw in the first semester of undergraduate course, the study of Illustrator in the second semester, and the study of Photoshop in the third semester. The learning time of computer software is arranged to the first grade of

undergraduate course in advance, and the teaching is carried out synchronously with the basic courses of modeling and form, so that students can experience the charm of computer software technology and experience the characteristics of professional courses in advance. Enhance students' interest in major learning.

TABLE I. KNOWLEDGE STRUCTURE OF COMPUTER AIDED DESIGN COURSE

Stage	Semester	Curriculum Module	Class Hour	Curriculum Nature
I	1	CorelDraw	48	Obligatory
II	2	Illustrator	24	Obligatory
	2	Photoshop	16	Obligatory
III	3	Photoshop	48	Obligatory

B. Arranging the Teaching Content of the Course Reasonably

According to the three levels of teaching objectives and systematic thinking concepts of the course, when setting up the teaching content, break the framework restriction of the original order of the teaching material, and reset the curriculum content according to the main line of software skills and practical post technology application. Software

knowledge changes from easy to difficult, and pays attention to the integration of software technology with design specialty and humanities. The specific arrangement is ("Table II"): the three stages are divided into 9 experimental items and 13 task subitems, each of which corresponds to a professional knowledge module, the software skills, professional subject modules and specific professional design knowledge are combined to form a whole in which the software is also coordinated and docked with each other.

TABLE II. TEACHING KNOWLEDGE SYSTEM ARRANGEMENT OF COMPUTER AIDED DESIGN COURSE

Semester	Curriculum Core Module	Number of Experiments	Task Item Number	Software Skill Knowledge Point	Corresponding Fields of Professional Courses
1	CorelDraw	3	5	Creation and adjustment of basic graphics, adjustment of graphic objects, mixed arrangement of text and graphics and text	Logo design, VI design, cartoon design, font design, album design
2	Illustrator	2	4	Path drawing adjustment, color filling, bitmap editing, the use of symbols and appearance, production of mixing and effect	Logo and effect design, illustration design, packaging design, book binding
2	Photoshop	1	1	Common basic commands, layer editing, creation and adjustment of selection, use of fix brush tools	Poster design
3	Photoshop	3	3	The synthesis of pictures, the use of path and shape, the use of layer mixing mode, the use of masks and channels, the production of filters and special effects, and the docking of Illustrator and Photoshop.	Advertising design, commercial special effects advertising production, wedding photography production

The specific teaching cases need to be carefully selected, carefully arranged, and the knowledge points should not only be able to correspond to the phased skill operation of the software, but also have the typical characteristics of professional knowledge and have a strong pertinence. It can bring good inspiration to students' creative professional design thinking. For example, in the study of CorelDraw module knowledge in the first semester, when explaining the mixed arrangement of text and picture and text, the teaching design is organized according to the design of enterprise picture book. For example, in the second semester of Illustrator module knowledge learning, in the path drawing adjustment, color filling adjustment, combined with the

curriculum knowledge of illustration design to carry out teaching.

In addition, due to the limitations of class hours, it is impossible to explain all the software skills and expertise in the classroom, which requires teachers to choose between the tool commands of some software, or arrange extracurricular time to learn.

C. Changing the Traditional Teaching Mode

Compared with the traditional teaching mode, there are more contents to be taught in the course at this stage, so the teaching cannot be carried out like the traditional mode of "teacher explanation tool command-case demonstration-

students follow the case operation" mode. Instead, it is necessary to fully arouse the subjective enthusiasm of students, make use of a variety of learning platforms, such as Mu class, micro class and so on, to extend the learning time to after class, to make up for the lack of time in the classroom. For example, according to the teaching goal of the current class, some basic software command knowledge and professional design knowledge in the case can be arranged on the platform of Mu class, micro class and so on, and the time and space of learning can be moved forward.

In class, according to the representative excellent cases designed in advance, the teachers' guide the analysis of the key knowledge points in the cases, and encourage students to find out the professional design knowledge and the specific technical application methods of computer software, and gradually operate to solve. Then the teacher arranges the actual professional design project, guides the student to use the design thought to carry out the conception, strengthens the design creativity, guides the student to draw the sketch, and then uses the software technology to complete the plan effect manufacture. Through the process practice of such a project, the students have not only mastered more comprehensive software skills, but also gradually established a more complete view of design thinking, which meets the requirements of three goal levels: the mastery of the software technical command of the course teaching, the analysis and application of the graphic form, and the application and creation of the design thinking.

In the whole process, teachers should do a good job in the organization of the classroom, such as fully mobilizing students' interest in learning, doing a good job in the guidance of professional knowledge and design thinking behind the case graphics, who give timely help when students encounter technical problems and professional design difficulties, and do a good job of teaching feedback and teaching assessment.

D. Carrying out Complete Assessment and Evaluation

Assessment and evaluation is the test of teaching effect. Because teaching is a systematic process, it is particularly important to establish a complete and effective way of assessment and evaluation for the teaching process according to the concept of systematic thinking. In the process of teaching, the assessment is divided into two parts: process assessment and result assessment, each accounting for 50%.

The process assessment mainly investigates the students' learning attitude, learning initiative and the completion of the project in the ordinary teaching process, and needs to make the corresponding records in the daily teaching process. The result assessment, mainly adopts the unified skill examination test, mainly investigates the student's software skill and the specialty creation design situation. In the operation, students are required to make the basic effect according to the specific sample drawing, make full use of the design thinking to carry out imagination, give full play to it, and create a design work with a strong sense of innovation and form. It should be noted that in the process of assessment implementation, it is necessary to establish an objective and

scientific scoring standard to avoid the arbitrariness and subjectivity of the assessment.

V. CONCLUSION

At present, in the course of computer aided design, under the guidance of the methodology of systematic thinking, software technology, design thinking and subject knowledge, etc. are combined organically to make full use of modern Internet resources and constantly improve teaching methods, effectively stimulate students' interest in learning, students' comprehensive design skills continue to be improved. At the same time, taking the practical and exploratory project design as the carrier, guided by the system concept, through the integration of a variety of teaching factors, students' creative thinking, design ability, teamwork ability and system control ability are effectively cultivated [4]. The design teaching process led by the cultivation of systematic thinking ability pays attention to the interdisciplinary field, the intersection and application of multi-disciplinary comprehensive knowledge, and the direct experience of the design process in combination with the project "Learn in practice". The formation of benign interaction between professional knowledge learning and design practice confirms the feasibility and effectiveness of introducing systematic thinking into the field of design education in the field of training mechanism.

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