Application Research of “Bionic Design” in Fashion Design Teaching Practice

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Abstract: As one of the important ways of thinking in college fashion design courses, bionic design connects and runs through before and after teaching. On the basis of enabling students to master basic theoretical knowledge, it focuses on strengthening teaching practice and cultivating students’ creative thinking. The article first gives an overview of the practical research on clothing bionic design; secondly, it analyzes the problems of bionic design in practical teaching of clothing design; Then it introduces the application form of “bionic design” in practical teaching of fashion design, and analyzes the performance and artistic value application of bionic design in fashion design. Finally, the application method of bionic design in fashion design teaching design is analyzed, and the integration and optimization of teaching resources are explored, so as to better promote the practical teaching of fashion design courses.

Keywords: Bionic design, Clothing design, Teaching practice, Teaching method.

1. Introduction

The application of “bionic design” in the practice teaching of costume design is one of the manifestations of costume modeling design. It takes all creatures, including human beings, as its reference object, and directly or indirectly applies the textures, Outlines, forms, lines, colors and functions of these creatures into clothing design to create a new look of clothing. The “bionic design” approach is adopted in the college clothing design courses to inspire and cultivate students’ creative thinking and draw inspiration from nature, ranging from mountains and rivers, rivers, trees and buildings to flowers and plants, birds and animals, fish and insects, and even the cells of life….. Designers draw materials from these natural objects of various forms and brilliant colors. In teaching, through appropriate clothing language, various thinking training forms such as imagination thinking training, associative thinking inspiration, reverse thinking inspiration, optical illusion space training, structure and combination training, design innovation of works. From material composition, structure design, process design, style design, color design and fabric reconstruction and a series of means to complete from conception to design, and then to the production of finished products, improve students’ original design ability and hands-on ability. This article takes the curriculum design concept of “Taishan College” fashion design teaching as an example, tries to apply the bionic design method of “learning from nature” in design aesthetics in modern fashion design, pursues the harmonious coexistence of design, nature and environment to achieve the goals of environmental protection, green and sustainable clothing design advocated by today’s society. However, the application of bionic design in the practical teaching of fashion design is not simply to imitate nature, but to explore the principles behind it, to extract and mine information and to seek innovation in the form of clothing products.

2. The Practice Research Overview of Bionic Design in Costume Design Course

Bionic design in clothing design courses mainly refers to the creative design of clothing by combining some research results of bionics in the process of clothing design. It has multiple characteristics of bionics, design, chronology, biology and so on, and is the continuation and expansion of bionics[1]. Bionic clothing design is not a simple imitation, but an exploration and innovation of bionic object characteristics. The “bionic design” teaching link in the fashion design curriculum system is a very interesting practical project combining theory and practice. It requires designers to comprehensively investigate external natural elements and related elements, integrate curriculum teaching resources, combine the knowledge structure of the curriculum system of clothing and costume design, and try to “learn from nature” according to the aesthetic design concept. This is not only the essence of traditional Chinese philosophy, but also the eternal theme of bionic design in costume design[2]. In recent years, scholars have studied the categories of personalized customized women’s clothing[9], textile clothing, casual wear, and children’s clothing from the perspectives of natural bionic elements[3], fabric bionics[4], morphological bionics[5], functional bionics[6], and color bionics[7-8]. This provides a rich theoretical basis for our curriculum instructional design. On this basis, some scholars have carried out bionic design research in the professional courses related to fashion design. They studied the creative elements, basic techniques and fabric form of clothing, such as silhouette, structure and texture. Explore the style features and modeling language contained in bionic creativity in women’s tailoring courses, and integrate bionic design concepts with women’s tailoring technologies[10]. There are also designers who use different materials to imitate the texture, organizational structure and texture characteristics of the original surface, and combine different techniques and languages to re-present the surface texture of the object. The fabric reengineering course, which can convey aesthetic emotions intuitively and vividly, also provides new ideas for the innovative performance of clothing design[11]. To sum up, the bionic design pursues the harmony and unity of man and nature, and the source of inspiration is based on the designer’s personal social experience and emotional feeling, and the embodiment of spiritual pleasure in the senses. The teaching design of “bionic design” in fashion design is exactly consistent with the connotation of the current students’ skill development.
Bionic design is an important form of costume modeling design. From direct bionics to indirect bionics, from figurative bionics to abstract bionics, from imitation to imitation, the changes in each process and the meanings and forms expressed by each work resonate with the designer’s life experience and inner feelings, making people surprised, excited or fresh. However, in the process of practical teaching, not all works can be satisfied, and not all students can understand the true meaning of bionic design. The reasons are mainly the following three aspects:

First, the knowledge structure system of teachers is not complete. Bionic design is to take nature as the Muse to find inspiration and make products. It is easy for the designer to grasp the styles to this restaurant, to this restaurant, to this very familiar dress, to this blouse, to this camo, to this bell-bottom, because they are imitation of this simple form.

But astronauts’ spacesuits are designed by scientists through research on giraffes (Figure 1), Chinese extravehicular spacesuits are derived from crayfish; Olympic swimmers’ swimsuits are inspired by sharks (Figure 2), police’s Bulletproof vests are inspired by spider silk (Figure 3), and raincoats are inspired by the water-repellent imitation of the wax on the surface of lotus leaves. These are functional bionic designs of bionic design. There is also a high-tech fabric that automatically changes color, photochromic fiber, which is based on the emergency system of the chameleon skin. In addition, the hollow fibers born from animal fur are widely used in the production of casual wear and outdoor sportswear due to their own warmth and resilience. For the above-mentioned bionic designs, there are simple shapes and colors bionic designs, and extremely complex functional bionic designs. However, due to the limitations of the teacher’s knowledge structure system, even with rich theoretical knowledge and years of experience in clothing design. In the process of teaching, teachers still focus most of their energy on three aspects: morphological bionics, color bionics, and texture bionics, and morphological bionics also focus on figurative bionics and abstract bionics. The content of image bionics is still very little. The knowledge of functional bionics is not comprehensive, because in addition to understanding the basic principles of bionic clothing design, it is necessary to study the basic content of bionics, and at the same time study the structure, characteristics, functions, energy conversion, information control and other characteristics of biological systems, which is a big challenge for me. At the same time, in addition to studying biological systems, teachers who conduct research on high-tech fabrics must also understand the properties of clothing fabrics and the professional knowledge of textile yarns, which also puts forward high requirements for clothing design teachers.

Second, bionic design needs to be highlighted in the practice teaching of clothing design courses. Taking “Taishan University” as an example, in the course arrangement of fashion design, the design module includes fashion color design, fashion design foundation, men’s wear design, children’s wear design, women’s wear design and creative fashion design, as well as three-dimensional cutting design, fabric texture design and accessories design. In all fashion design courses, bionic design is integrated with each other. Designers find inspiration, information collection, conception, preliminary assumption, and then style design, structure design, color design, craft design and a series of procedures,
the final work. Where the inspiration comes from, we need to investigate the external natural world and related elements, and integrate course resources, which is the teaching idea of project teaching and modular teaching. However, bionic clothing design is not highlighted in the process of teaching design because of the independence of the content arrangement of various courses and the relevance between courses. When we conduct clothing design, we will start from the initial imitation and finally return to bionics and simulacra, or simulacra, or bionics. We will make detailed classification and explanation in the course teaching. At the same time, the arrangement of class hours also makes the realization of the whole process of bionic design practice teaching more difficult. Therefore, the teaching design of bionic clothing design should be prominent, and the arrangement of class hours should be reasonable. In the future, it is hoped that the makers can give reasonable consideration to the revision of the training program, rather than finishing the course by only designing or making one work in each course.

Thirdly, students’ one-sided understanding of “bionic design” and narrow vision in costume design are also the main reasons for single design works and lack of creativity. When it comes to bionics in costume design, students are best at using color bionics and form bionics. They only take its shape without considering its meaning. I often see works where the inspiration is surprisingly consistent with the work, but lacking in beauty. However, for structural bionics and functional bionics, most of the students are imaginative and lack of thinking. In the process of finding inspiration, their knowledge accumulation is weak and their cultural background is not deep enough, resulting in the inability to integrate knowledge. In addition, skill learning is not serious enough, and there are good ideas, but without technical support, new ideas cannot be realized, and bionic design works always lack connotation. Especially in the current wide application of 3D digital clothing design system, we must learn for our interests, and in the learning process, we should have a dialogue with the nature of the world, our predecessors, and the society, so as to free our minds from the fetters of our bodies. Students will have new creativity only when they learn consciously and with interest. As teachers, we must have our own inner world, which is the key to teaching. We must constantly revise our roles, think in a different position, understand the characteristics of each student, avoid cramming education, let each person play freely according to their personality, encourage students to go out, read more, think more, and design better of bionic clothing designs.

4. The Application Form of “Bionic Design” in Practical Teaching of Fashion Design

As the main course of fashion design major in colleges and universities, fashion design course is intended to enable students to master basic theoretical knowledge, focus on strengthening teaching practice, and cultivate students’ creative thinking. “Bionic design” is an important link in the fashion design course. The connection and penetration of the teaching can allow students to be rooted in life and develop design thinking. Rodin said: “There is no lack of beauty in life, but a lack of discovery. If we have a unique vision and are good at thinking, we will have different discoveries.” Bionic design based on nature and life, combined with fashion, fabric and color of fashion design trend, will integrate the knowledge of fashion style design, fashion color design, fashion modeling design, fabric design and fashion accessories design. The works can not only meet the needs of modern industrial products, product performance can also be better reflected.

4.1 The Application of “Imitation Form” in Clothing Bionic Design

Bionic design starts from the movement of human body. Animals, plants, buildings and all kinds of geometric figures in nature will become the objects of our imitation. Due to the rich and colorful changes in costume modeling design, almost all natural and artificial forms are included, including geometry, object image, symmetry, asymmetry, exaggeration and other forms, all of which can be found in nature. Like bloomers, flared trousers, lotus leaf collars, tuxedos, etc., everyone is familiar with it. There is also a “fishtail skirt” with just the right cut to make the wearer’s body slimmer, highlighting the elegant lines of women, and making a sharp contrast between the slender waist and the raised crotch. As an important form of clothing design, bionic design plays a pivotal role in expressing the style of clothing and expressing the connotation of design. However, the imitation design of clothing should be based on beautiful appearance, well-fitting, soft and comfortable, and easy to move. Therefore, not every image of an object can be imitated. Because some objects are not beautiful in themselves; some shapes are not suitable for human wear; some can only imitate parts; some should be generalized, abstract and exaggerated. The hourglass shape we are familiar with can only be used to exaggerate the design of the rounded shoulders when adopting the design (Figure 4). When using a triangular design, you can only use its tapered design on the cuffs or trousers of the style, or apply it from the waist down to the skirt in wedding dress design, so that it can form a sharp contrast with the whole piece or the whole shape. contrast (Figure 5). In addition, when fashion design is inspired by form, it is completed by imitating the form and borrowing color, the connotation of cultural and social thoughts, and the display of materials (Figure 6), thereby generating new forms of expression. But if a piece of clothing is actually made into an insect or a plant, it will only make people surprised and ridiculous. These are the experiences summed up in the imitation and reference of natural features.
4.2 The Application of “Imitation Color” in Clothing Bionic Design

Color is often considered to be the eye of beauty, and color design is an important factor in fashion design whose innovation lies in the use of color language to move the audience. Designers look for the harmony and unity of design from the collocation of color purity and brightness. The combination of high brightness and high purity can improve each other’s brightness and purity, so as to obtain visual coordination. Form expresses feelings, color expresses emotion. Color is nature’s greatest gift to us. Spring peach green, flowers in full bloom; Summer flowers, lotus leaves full pool; Autumn orange yellow orange green, layer forest all dye; White snow in winter and white snow in winter can be selectively used by designers (Figure 7). Some students always use the color card to compare the same color, contrasting color or complementary color, but in the end there is no result. At this time, you might as well go out and take a look to see why the color of the leaves turns yellow and falls on the grass, why the color of the grass and the color of the leaves are so coordinated. In addition, the flowers do not turn red at once. During the process of color transformation, the color transition from white to light red to pink and finally to red will be so natural. The red building looks a little out of place in the surrounding environment, but why it fits in well with the construction of the city. Color is a gift given to us by nature. As long as we carefully discover and understand the spiritual connotation of nature, communicate with the emotions of nature and learn from it reasonably, the bionic clothing design works will definitely make people’s eyes shine.

Figure 5: Triangle design (Wedding dress)

Figure 6: Form design (Creative clothing)

Figure 7: Faux color design works (Designer: Liliya Hudyakova)
4.3 The Application of “Imitation Meaning” in Clothing Bionic Design

Rongrong Cui summed up in Clothing Bionic Design Art: “Image bionic design is actually indirect bionic design, it can be” shape “similar but very” likeness “, it requires designers must have rich emotions to associate and innovate. It can be said that it is the deepening and sublimation of clothing bionic design.” Imitation, imitation color in a sense is the formal expression of imitation and is concrete imitation. Imitation meaning means indirect imitation, which is a designer who triggers associations according to the texture, shape, color and image of natural objects, and then abstracts and innovates according to their own cognitive and emotional changes. This requires designers to complete the knowledge structure system as much as possible, and to have a profound cultural background, and to further study and understand the fashion trend and aesthetic connotation of imitation clothing design. We talked about imitation color earlier. In this multi-faceted era, the popularity of colors is variegated, colorful, and a variety of color themes are available for fashionable people with different hobbies and personalities to choose. For the imitation of color, the popular color proposals we are familiar with are all derived from the existence of natural objects in nature: tropical rain forest, blue sky and white clouds, autumn rain, red leaves in the mountains, Tang Sancai, murals in the Mogao Grottoes in Dunhuang, etc. Through research and preferences of consumers, color experts spy on consumers’ hearts, comprehensively analyze the political and economic situation of the next quarter, and extract colors that can represent the next season from the natural scenes they recognize to cater to most People’s subjective cognition to achieve emotional resonance. In addition to the imitation in color, it is also unique in the use of materials. Popular three-dimensional clothing fabrics are influenced by architecture and sculpture art. The surface texture of the fabric is changed by various methods such as folds, folding, and filling, and unevenness is created on the flat fabric to enhance the three-dimensional appearance of the fabric (Figure 8). You can also add pleats, splicing, rivets, embroidery, and gold and silver threads to the flat fabric, and add various delicate and ingenious decorations to the fabric to add artistic charm to the original design. When using these recreated fabrics for clothing design, the sense of form is rich, which plays the role of finishing touch. For example, in the 15th China Dalang Woolen Clothing Design Competition, a clothing series with the theme of “Line Image City” (Figure 9), wants to use the way of clothing design to outline the city map with various lines. When expressing the theme, the materials are matched with leather, knitted fabrics, knitted wool, and gold threads woven into the fabrics. In order to express the theme of “line-like city” in specific operations, we can use leather splicing, combination of color blocks of knitted fabrics of the same color, weaving with thick and thin wool, or weaving gold threads into finished garments to performance city-map. At this time, the fabric will have different texture effects, and each expression technique is distributed in different parts of different styles. Due to the different forms of expression, the visual effects are obvious, and the works are also eye-catching. This is only the performance part of the materials, and the overall collocation of style, color, craftsmanship and decoration should be comprehensively considered in the specific design.

Figure 8: Fabric three-dimensional design (personal design works)

Figure 9: Work: Line Image City

5. The Application Method of Bionic Design in Fashion Design Teaching

Bionic design occupies a large proportion in today’s fashion trends. Many brands integrate bionics into clothing design, which is deeply loved by fashion fans. The introduction of bionic elements into clothing design makes it constantly innovatively used in clothing design, making the teaching method more flexible. At the same time, because it is very easy to understand its design concept and inspired by it, it is considered to be the most basic design method most suitable for students to learn clothing design. The inspiration that comes to mind is often the prototype of the original vagueness, and many inspirations cannot be directly applied to clothes, and must be processed through some special design skills. The modeling method includes many specific forms, and their common feature is the reconstruction of the original form, which takes the original form as the basis and starts from a new form to consider. The methods often used in the teaching of “Bionic Design” in the fashion design course include the theme teaching method, the fusion method and the extraction method.

(1) The theme teaching method is a design method often used in bionic clothing design, and it is also a teaching method that is widely implemented in clothing and clothing design majors in colleges and universities at home and abroad. Compared with the task-driven teaching mode, thematic teaching can better reflect the depth and breadth of teachers’ understanding of the teaching content of this link. Because this teaching method will also be used in other courses of fashion design, such as creative pattern, fabric reconstruction and other courses. We can connect the teaching content of several courses to each other, and keep the content of a theme consistent through the combination of materials, modeling, craftsmanship and other content and bionic design courses. For example, all students take “feather element” as an example to study the use of color in bionic design of natural elements, modeling characteristics, application methods of fabric texture and texture pattern, and then study their application types and characteristics in bionic clothing design. Taking this as the starting point, it is refined to feather
elements, and the application methods of feather elements in clothing design are analyzed from three aspects: the use of concrete images, abstract generalization, and the expression of images and associations. Or each student chooses a theme (animal, plant or architecture) and determines the source of inspiration, abstracts it according to his own understanding, and applies changes and combinations of its shape, color, and characteristics to clothing design. Combined with 3D digital clothing design software, the 2D plane graphics are transformed into 3D three-dimensional models, and people are automatically brought into the artistic conception of clothing. People will feel immersive when they see the designed clothing, and sometimes wander around Between mountains and rivers, sometimes walking in the vast grasslands, sometimes as if walking in the universe. This is the uniqueness of the thematic teaching method.

(2) The fusion method is to combine new materials, new technologies and fashion design techniques, design scales, design levels and creativity. With the development of science and technology, people continue to expand the unknown fields such as ocean and space, and their knowledge of some deep mysteries in nature has also changed from the original macro to the micro. People have strong curiosity, and are full of awe and curiosity about the unknown field, especially the curiosity of life brings endless reverie to designers. Magnifying microscopic objects often brings people a strong shock. For example, the texture of leaves, the arrangement and combination of DNA under the microscope and other microscopic objects, the designers reorganized and sorted out the creative points, and then uniformly organized in the same clothing and formed layers. In this process, by reorganizing design elements to form creative elements (design elements, material elements and technical elements), find the focus and teach students the ability to reconstruct multiple elements which refers to the distortion, deformation, reorganization and superposition of various microscopic objects or designs. In this way, the design elements of “bionic design” are integrated with new materials and new technologies, and everyone can feel that the design is more and more fashionable and upgraded.

(3) The extraction method is to extract the elements that you want to use from the research object according to your own design needs which may be that the shape and color are applied to the clothing design as a whole or in part, or only a small point of a form is used in the partial clothing design, and on the basis of this point, the radiation or change of the design is started. Radioactive design often uses radial modeling for clothing or partial decoration, such as the radial structure of the peacock opening screen. The changing design of bionic clothing can apply the inspiration point to the outer shape, color, fabric, parts, details, accessories and patterns of the clothing, and seek an internal and scientific transformation between the ecological form. The bionic design organically integrates the natural world with the shape of clothing to produce a new visual experience.

6. The Development Trend of Bionic Design in Modern Clothing Design

Bionic clothing design is to link bionic design with design innovation. Form imitation, color imitation and means imitation are inspired by nature, combined with their own knowledge accumulation and experience, to re-create products. Bionic design makes clothing design more broad, more active form of expression, no longer stuck in the past dull color, old style and conventional fabric. With the continuous understanding of nature and the development of technology, we will have more and more new discoveries. Designers skillfully use design language to properly process the obtained information and create new clothing works, so as to “learn from nature and integrate nature and man”. Imitate nature and rise above it. With the acceleration of the digital transformation of clothing enterprises, the use of the current new technology—the construction of 3D digital clothing design models and the popularization and promotion of the metaverse, the teaching methods of bionic design are becoming more and more abundant, and the works will also allow consumers to have more experience and immersion. Green, low-carbon and sustainable bionic design is the development trend of teaching application and research of clothing bionic design in the future.

References


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