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Research on Innovative Application of Modular Design in University Student Apartment Furniture

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Abstract. Based on the analysis of the application status of modular furniture in college students'apartment furniture, and taking the excellent design examples as the reference plane, this paper explores the innovative application forms of modular furniture from the perspective of function, shape, color and space, with a view to creating a private space and one belonging to them for the current college students in the fast-paced college life.

1. Introduction

Modular furniture can be disassembled and combined at will, and matched freely according to users'needs, thus forming a product with new visual effects and functions. The design of apartment dormitory furniture is not only related to the comfort of students'accommodation, reflecting the humanistic concern of the school for students, but also an important part of college students' apartments, which participates in the construction of university brand to a certain extent. With the emergence of modular design, there are more possibilities for the furniture design of college students'apartments[1].

2.Modular design and furniture of college student apartments

2.1.Modular design

In product design, design modularization means that the product can be divided into several modules, each module has its own independent function and has the same input and output port, so that users can combine each module perfectly according to their own needs to form a new form, which will have new visual effects and functions. Modular products have the characteristics of relative independence, interchangeability and versatility. Firstly, each module is relatively independent and has its own function and form, which can exist independently. Secondly, each unit's products have a consistent access point, which is conducive to the interchange between modules. Finally, the modular generalization between horizontal and vertical is conducive to the realization of the generalization of cross-series products.

2.2.University student apartment furniture

Apartment is an important place for college students to live and study on campus. It is also the basic position for them to perceive social reality and form interpersonal relationships. College students'apartment furniture is different from traditional household furniture. The use environment is dormitory, the living area is tense, the living environment is single, the space is relatively narrow, and the main object of service is students. The types of dormitory furniture are less than traditional household furniture, mainly including tables, chairs, beds, cabinets and so on. With the development



of modern society, students'demand for dormitory furniture is diversified. College students'apartment furniture should not only meet the functional needs of students for dormitory design, but also become a participant and shaper of dormitory culture. Therefore, its design is no longer a simple solution to the functional and morphological problems, but should deal with the multi-symbiotic relationship among desks, chairs, beds, cabinets and other apartment furniture, so as to realize the innovative application of modularization in university student apartment furniture[2].

3. A comparative analysis of the current situation of furniture design of university student apartments at home and abroad

3.1.Domestic situation

Domestic accommodation system mainly arranges for undergraduates to enter the dormitory when they enter school. Postgraduates and doctoral students can apply for dormitory. In 2001, China's Ministry of Education issued "Several Opinions on the Standards for the Construction of Apartments for College Students", which stipulated that there were four undergraduates with an average floor area of 8m² per student, two postgraduates with an average floor area of 12m² per student, and one doctoral student with an average floor area of 24m² per student. From the founding of the People's Republic of China to now, there are obvious changes in the facilities, shape and number of student dormitories. In terms of building volume, there are low-rise, multi-storey and high-rise buildings; in terms of the plane composition of dormitory buildings, there are corridors, short corridors and units; in terms of the spatial layout of residential units, there are hotel-style and family-style; in terms of space function, the bedroom is the prototype, combined with living room, toilet, kitchen, balcony and other spaces, and is no longer limited to the "421" standard of the ministry of education. Various spaces are combined with each other, and the combination modes are changed to form various unit nests.

The survey shows that although many colleges and universities are committed to improving construction facilities and living conditions of students, they are still insufficient. In fact, many schools are not up to the standard. It will take a long time for the situation to change. Per capita living space is small, and many dormitories are in disorder. Some colleges and universities have made some alterations, and still use them. The evaluation index of safety facilities and accommodation area in dormitory buildings is low. Of course, this is also related to the large number of students enrolled in colleges and universities at present, and the construction of student apartments no longer depends on state funding. Nowadays, the overall level of social economy and science and technology has greatly developed, and the psychological characteristics, quality of life and ways of college students have also changed and improved significantly. The results of big data analysis and statistics show that college students'demand for dormitory furniture is no longer a single functional level, but pay more attention to sleep, storage, leisure, information-based learning and other multi-functional furniture. However, at present, many college students'apartment furniture in China are more traditional, mainly strong, durable, single layout, can not meet the needs of students at different stages, different personalities, lack of innovative design features as shown in Figure 1.



Figure 1. Apartment furniture of domestic colleges and universities

3.2.Status quo abroad

Foreign research on university students'furniture is earlier than the domestic, which is related to the

development psychology research earlier than domestic research. Its research results are relatively rich, and its application in the field of practice is more extensive, which is not overnight to catch up with. Compared with the domestic situation, the big difference is that many foreign universities do not require students to live in school apartments. Most international students choose to rent a house, not a dormitory, that is, to share a villa or apartment with others, basically one-room.

The environment in the dormitory area is pleasant and beautiful, which makes people feel relaxed and happy, friendly and comfortable, easy to communicate freely, active life, and conducive to academic discussions. The accommodation conditions are better, but the quantity is limited, and the price is more than several times higher than that in China. Overseas dormitories are roughly classified as dormitory collective type, hotel type, apartment type and residential type. At present, we are discussing the type of collective dormitory. According to the survey, it is similar to the domestic design of space and furniture. It is different from the most common four-person room in China. The most common type of room in foreign countries is double room and single room. As far as equipment arrangement is concerned, students in developed countries come from complex sources and age gap is relatively large. Schools will try to arrange students with similar culture, diet and living habits together.

The application of modular design in foreign countries is obviously more than that in domestic countries. Its design is mainly simple and generous modular furniture, which can be used independently and randomly, so that dormitory space does not need to be restricted to the division of functional areas.

4. Case Study on furniture design of modular college student apartments

4.1. Scholarship in university of Bangkok

Through the study of Fabrica, an Italian exchange research institute in Treviso, the concept of co-living space is a "space scholarship" offered by the Thai government to seven economically disadvantaged students, which not only provides sleeping and learning functions, but also includes space settings for communication and interpersonal relationships. We can clearly see that the application of modularization and intellectualization in the field of student dormitories is completely feasible. Figure 2 shows the overall residential effect.



Figure 2. Space Scholarship Dormitory

Its modular design features in the girls' dormitory are as follows:

- Unlike previous upper deck designs, each student's sleeping area has its own stairway entrance. The designer surrounded the ceiling with an iron frame for students to air their clothes.
- In the design of personal privacy, the designer has also made great efforts. Every student's sleeping area has added bedpanels and curtains, which open when needed and close when sleeping. A light shield is also attached to the outside of the lamp. Turning on the light at night can reduce the brightness of the light and control the direction of the light, so as not to disturb the roommate with poor sleep quality, as shown in Figure 3.



Figure 3. Personal privacy space processing

- About acceptance: using the space of edges and corners to do acceptance. The shelves drawn from the upper and lower layers can hang clothes or put some small items, as shown in Figure 4.



Figure 4. Inclusion space processing

- Independent learning space: dining table and desk design. Without interrupting each other, it creates an atmosphere of small libraries as shown in Figure 5.



Figure 5. Multifunctional dining table

The spatial planning of the male dormitory is slightly different. Four boys are divided into two separate bedrooms, each with its own desk.

- Humanized design: considering the height of boys, designers will open the distance in the design of beds.
- Desk design: the ceiling is also surrounded by a circle of iron frame, can hang some lightweight furniture, when used can also be moved according to location. The lamp can also be moved as needed.
- Colour collocation: the overall tone is mainly log color, simple and textural. In order to reflect the youth and vitality of university life, the designer also added bright yellow, orange, blue and other colors to make the dormitory more lively and bright as shown in Figure 6.

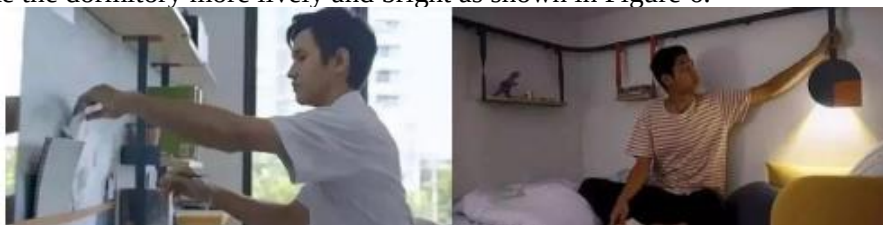


Figure 6. Furniture design of boys' dormitory

4.2. Tietgenkollegiet in university of Copenhagen

Tietgenkollegiet is a student dormitory near the university of Copenhagen South Campus. The student dormitory has won many architectural awards and has been hailed by some media as "the coolest student dormitory in the world". Tietgenkollegiet's design was inspired by Tulou in Fujian, China, so

Chinese students in Denmark kindly call this dormitory "Geda Tulou". The whole building has 360 single or double dormitories, 30 kitchens and public areas. These kitchens are like boxes hanging inside the circle building. They are very technological. Tietgenkollegiet is not only unique in appearance, but also innovative in interior decoration. Designers Aggebo and Henriksen have boldly applied their Nordic modular design concepts to the interior decoration of student dormitories, as shown in Figure 7.



Figure 7. Furniture design of Tietgenkollegiet dormitory

5.Design strategy of university apartment furniture based on modularization concept

Colleges and universities are an important base for talent cultivation in China. With the reform and development of higher education and the continuous progress of society, the material and spiritual functions of college students'dormitory construction are extending towards diversification and depth. The influence of university environment on talent cultivation is both imperceptible and far-reaching. From the above description, the current modular university apartment furniture design has a lot of room for development. Not only can it solve the current problem of overcrowded dormitories in major universities, but also bring many conveniences to students'lives, improve the quality of life of students, and also make parents more comfortable. The advantage of modular design of dormitory furniture for college students is obvious. It not only greatly increases the space utilization rate of dormitory for college students, but also has more flexibility. By disassembling modules, dormitory furniture can be varied, and dormitory life for college students can be more practical and flexible. The modular structure realizes many functions, and embodies the concept of humanization and humanistic care[3].

5.1.Diversified furniture design and attaching importance to use habits and taking into account private need.

Furniture design is related to college students'physiological and psychological needs and ways of use. The attitudes, interests, emotions and needs of students in their daily activities will change with the use of different situations. Therefore, the facilities provided for their activities in apartments should be adjusted accordingly, with a variety of characteristics. From the perspective of space division, the limited space in the apartment, so we should break the traditional standardized living form to meet the diversified needs. The modular design is applied to the design of apartment furniture in colleges and universities. Based on the function analysis, modular system is established by decomposition layer by layer, which makes it possible to unify standardization and individualization. Different products can be assembled by selecting modules. We should be able to change from privacy to semi-openness and then to openness at any time, realize flexible functional adjustment, and satisfy students'various demands of study, life and communication[3].

5.2.Expanding residential space of apartments to realize individualization

Humanized design is the highest goal pursued by modern design and the inevitable product of the development of social civilization. At present, the standardized allocation of apartments makes it difficult for students to embody their personality and freedom, which is bound to be unable to adapt to the future trend of use. The age stage of college students also determines that the accommodation environment should be younger and personalized. The effective way to solve the problem of individualization is to introduce the mechanism of "elastic design" into apartment furniture design,

that is, under the condition of the original furniture volume, furniture can be properly shifted, folded, pulled out and retracted. Flexible design enables furniture to have a variety of functions and forms, which can be obtained in relatively small spaces.

5.3. Intelligent home equipment

With the socialization of university construction and the advent of the information age, education is becoming more and more modern. Intelligent education environment also needs modern accommodation environment to adapt to it, and information-based learning media has also changed the way students live and live. Students will use computers to study, complete homework, entertainment and access to information has become a common phenomenon in modern colleges and universities, electronic information technology and traditional apartment furniture combination of new products have emerged, and has a strong development potential. For example, the lamp not only maintains the original use function, but also charges the electronic equipment as a mobile power supply, but also charges the mobile phone wirelessly, bringing endless fun and new experience for college students' life and learning[3].

5.4. Reasonable use of decorative soft environment to create cultural atmosphere

Furniture design not only requires innovation in function, but also in material, color and soft decoration, so as to make apartment furniture more individualized and innovative. The surveys show that the overall design of apartments is almost the same at present. Furniture modelling is very similar and the color is single. Take the color as an example, the existing apartment furniture hardly takes into account the problem of color matching. On the whole, it generally adopts single colors, such as log color or milky white, which is general and monotonous, and the environment seems rigid and indifferent. In the design, we should reasonably control the decorative elements such as color and texture. We can provide several different color modules for the users, for example, the local color of furniture used by boys and girls can be different, and different functions can also be combined with color to reflect. The introduction of local culture can be considered, such as incorporating the typical water culture into the design, helping students integrate into the city, so as to better study and life.

6. Summary

As far as modular design of apartment furniture in colleges and universities is concerned, further research can be done on the diversity of connection modes of "No Tools" concept and the evaluation system in the future to improve the flexibility between modules, achieve the goal of easy and convenient disassembly and reorganization of furniture modules, and better realize the modular use of furniture. Scientific and reasonable evaluation system is conducive to the further optimization of modular design of apartment furniture, so as to provide more comfortable living space for contemporary college students.

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