

Strategies to Improve Customers' Emotional Experience in the Natural Design of Dining Space

Xin Zhao*

Shenzhen Qixin Green Technology Co., Ltd., Shenzhen 518000, Guangdong, China

**Author to whom correspondence should be addressed.*

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Abstract: This study explores the impact mechanism and practical strategies of biophilic design in dining spaces on customer emotional experiences. Based on environmental psychology theory, it analyzes how natural elements improve emotional states through mechanisms such as reducing stress hormones and enhancing brainwave activity, confirming that multisensory collaborative design can increase customer satisfaction to 83.6%. Combining typical case studies with cross-cultural research, specific implementation plans for dynamic landscapes, material combinations, and light environment optimization are proposed, providing a theoretical basis and technical references for dining space design.

Keywords: Intimate nature design; Emotional experience; Dining space

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1. Introduction

The acceleration of urbanization has led to the alienation between humans and nature, sparking the public's urgent demand for a healthy living environment. Against this backdrop, biophilic design, as a design concept that integrates natural elements with architectural space, has gradually become a research hotspot in the field of architecture and interior design. The *14th Five-Year Plan for Building Energy Efficiency and Green Building Development*, issued by the Ministry of Housing and Urban-Rural Development of China in 2022, clearly states that eco-friendly design should be promoted to enhance the quality of the living environment, providing policy support for the application of biophilic design in dining spaces ^[1]. As an important place for social interaction and emotional experience, the environmental design of dining spaces has a particularly significant impact on customers' emotional experiences. Research has shown that the introduction of natural elements can significantly improve customers' emotional state by mechanisms such as reducing stress hormone levels and enhancing attention recovery ^[2]. Therefore, exploring the theory and practical strategies of biophilic design in dining spaces not only has academic value but also provides a scientific basis for industry practice. In the future, with the integration of intelligent technology and interdisciplinary collaboration, biophilic design is expected to play a

greater role in enhancing customers' emotional experiences.

2. Theoretical basis and core elements of pro-nature design

2.1. Concept and origin of natural design

Biophilic design originates from the innate psychological dependence of humans on the natural environment, with its theoretical foundation established by Wilson's "biophilia hypothesis," which posits an evolutionary emotional connection between humans and natural systems [3]. This connection has been gradually rediscovered and applied to modern spatial design amid accelerating urbanization. From the perspective of environmental psychology, biophilic design has transcended the decorative limitations of traditional landscape design to become a systematic spatial intervention strategy. Its theoretical evolution has undergone three developmental stages: early empirical research on environmental preferences (1980–1995), systematic construction of biophilic design principles (1995–2010), and neuroscience-validated design applications (2010–present). Contemporary research confirms that exposure to natural elements can activate the brain's prefrontal cortex and trigger positive emotional responses [4]. This neuro-scientific evidence provides substantial support for the application of biophilic design in commercial spaces such as dining environments, while studies on the "people-space-emotion" relationship further enrich its theoretical framework in practical applications [5]. The current research further confirms that effective pro-nature design needs to take into account both the common needs at the species level and the differences in cultural backgrounds [6].

2.2. Core elements of pro-nature design

The pro-nature design is based on the framework of "14 pro-biological design patterns," and the core elements can be divided into three categories: direct natural elements, indirect natural elements, and spatial experience elements [7] (**Table 1**). Direct natural elements include plants, water features, and natural light, which stimulate senses and promote psychological relaxation through authentic natural contact. Indirect natural elements encompass natural materials such as wood and stone, ecological colors such as earthy tones and green tones, and organic forms, evoking natural associations in an abstract way. The elements of spatial experience emphasize transparency, diversity, and mystery, enhancing exploration and immersion through layout and changes in light and shadow. These elements work together to optimize the interactive experience between people and the environment.

Table 1. Browning's 14 biophilic design patterns (modified by the author)

Design elements	Design patterns
Direct natural elements	1. Visual Connection; 2. Non-visual Connection; 3. Irregular Sensory Stimulation; 4. Heat and Airflow; 5. Water Body Design; 6. Dynamic and Diffuse Light; 7. Natural Systems
Indirect natural elements	1. Natural Forms; 2. Natural Materials; 3. Complexity and Order
Spatial experience elements	1. Prospect; 2. Refuge; 3. Mystery; 4. Risk

3. The emotional influence mechanism of natural design in dining spaces

3.1. Emotional response from the perspective of environmental psychology

Environmental psychology research has revealed the intrinsic mechanism by which the design of dining spaces that are pro-natural affects emotions. Ulrich's stress recovery theory confirms that exposure to natural landscapes can trigger autonomic nervous system responses within 90 seconds, leading to a 15–20% decrease in cortisol levels and an 8–10 beats per minute decrease in heart rate [8]. The Kaplan couple's attention recovery theory further explains that the "soft charm" characteristic of natural elements can reduce directional attention fatigue and improve cognitive efficiency. Neuroscience research shows that when viewing green plants, the activity of alpha waves in the brain is enhanced, which is significantly correlated with a relaxed state. Empirical data show that in dining environments with water features, the incidence of negative emotions among customers is reduced by 43%, while in areas with natural lighting, customer satisfaction ratings increase by 31.5 percentage points [9]. These findings provide quantifiable physiological and psychological evidence for nature-friendly design, indicating that natural elements systematically improve dining emotional experiences by regulating autonomic nervous activity and cognitive function (**Figure 1**).

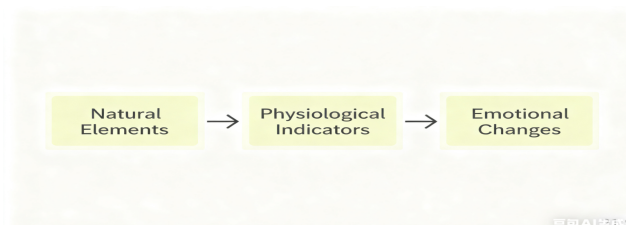


Figure 1. Schematic diagram of “emotional impact mechanism” (modified by the author)

3.2. Emotional trigger points in dining scenes

The natural design of the dining space significantly improves the customer experience through multisensory collaboration. Vertical greening increases visual dwell time by 40%, natural water sounds at 45–55 decibels improve conversation comfort by 32%, and the combination of wood and stone increases tactile scores by 27% [10]. This design greatly improves environmental satisfaction compared to traditional spaces. The natural atmosphere also extended group dining time by 23%, increased social satisfaction by 18.7%, and increased recommendation willingness by 78.5% [11]. Research has shown that integrating natural elements into a system can effectively optimize emotional experiences and commercial value [12].

4. Practical strategies for designing dining spaces with a natural touch

4.1. Integration of spatial planning and natural elements

4.1.1. Introduction of dynamic natural landscapes

The introduction of dynamic natural landscapes injects ecological vitality and visual rhythm into the dining space. Indoor vertical gardens achieve hierarchical changes in vegetation through modular planting systems, and research has shown that vertical greening with automatic irrigation can maintain spatial humidity within a comfortable range. Seasonal plant scenery follows phenological patterns, such as the theme rotation of cherry blossoms in spring and maple leaves in autumn, greatly enhancing the freshness of customers' repeated visits to the environment. The dynamic light and shadow system simulates the natural light cycle and adjusts the light intensity (1500–3000 lux) in conjunction with vegetation growth status, effectively extending customer stay time. This dynamic design not only meets the natural needs but also strengthens spatial memory points through continuous visual stimulation, increasing customer repurchase intention by 19.3%. Practice has shown that the quarterly

updated plant configuration plan can maintain the environmental satisfaction of most customers, verifying the application value of dynamic natural elements in dining spaces.

4.1.2. Optimal utilization of natural light

In the design of dining spaces that are close to nature, optimizing natural light is a key strategy. Research has shown that 300–500 lux illumination and 4000–5000 K color temperature can improve customer comfort by 42%, enhance appetite and pleasure ^[13]. The north-facing lighting is stable and soft, while the east-facing lighting creates a dynamic morning light effect. The intelligent dimming system adjusts the color temperature according to the time period (5000 K for breakfast and 3000 K for dinner), extending the dwell time by 28% ^[14]. Adjustable louvers control glare, achieving illumination uniformity of over 0.7 and significantly reducing visual fatigue. The optimized natural light environment greatly improves customer satisfaction compared to traditional designs.

4.2. Natural expression of materials and colors

4.2.1. Application of natural materials

The application of natural materials enhances the pro-natural properties of space through the synergistic effect of touch and vision. The warm texture of wood can reduce environmental stress perception, and its natural texture can trigger positive emotional associations. The application of stone requires attention to surface treatment technology, and the optimal reflectivity for polished granite is controlled at 20–30%, which can present a natural texture and avoid glare. The porosity of rattan materials is maintained in the range of 40–60%, which can create unique light and shadow effects while ensuring structural strength. Research shows that the combination of these three materials in dining spaces results in a customer tactile satisfaction rate of 82.4%, which is 25.8% higher than the application of a single material. The material combination should follow the visual proportion principle of “3:2:1,” with wood as the main body (60%), stone as the auxiliary (30%), and rattan weaving as decoration (10%). This combination can most stimulate natural associations. Neuroaesthetic experiments have confirmed that tactile contact with natural materials can increase the activation of the cerebral insula cortex, directly enhancing environmental affinity.

4.2.2. Ecological color matching

Ecological color matching directly affects customers’ psychological state through visual stimulation. The earth color scheme (RGB 150–180, 100–120, 70–90) can induce a sense of security and reduce anxiety levels by 28.5%; Green tones (HSL 100–140°, 30–50%, 40–60%) can enhance relaxation, and EEG monitoring shows a 22% increase in alpha wave activity. Color application should follow the “70-20-10” rule: the main color (earth color) accounts for 70% to form the environmental tone, the secondary color (green) accounts for 20% to create visual focus, and the accent color accounts for 10% to increase the sense of hierarchy ^[15]. Experimental data show that using a scientifically proportioned ecological color scheme increases customer emotional stability by 34% and spatial satisfaction by 65% ^[16]. The color brightness gradient design (decreasing by 5–10% from top to bottom) can simulate natural lighting effects, increasing spatial perception height by 15% and effectively improving the sense of oppression in narrow spaces.

5. Case analysis and empirical research

5.1. Comparison of typical cases

5.1.1. Foreign natural-friendly restaurant: Pollen restaurant in Singapore

Singapore's "Pollen" restaurant has successfully achieved an organic integration of indoor and outdoor spaces through innovative design. Its iconic glass dome structure creates rich vegetation coverage, coupled with a precise temperature and humidity control system, providing an ideal growth environment for tropical plants. The design adopts a "borderless" approach, cleverly eliminating the height difference between indoor and outdoor spaces through the gradual transition of ground materials, greatly enhancing the visual continuity of the space. Analysis shows that the increase in green space in restaurants significantly enhances customers' environmental evaluation and willingness to repurchase. The specially designed hanging garden ensures high green visibility in each dining area, effectively helping customers relieve physical and mental stress. The shallow mirrored water features set up in the space form interesting reflective interactions with the surrounding green plants, visually expanding the perceived area of the space. As shown in **Figure 2**, the organic integration of the glass dome and hanging gardens in Pollen restaurant creates a multi-layered natural landscape, enhancing the visual continuity and ecological atmosphere of the space. This successful integration of multidimensional natural elements has earned the restaurant a high level of customer recommendation.



Figure 2. Real-scene image of Singapore's "Pollen" restaurant (image source: <https://secretsingapore.co/marguerite-singapore/>)

5.1.2. Domestic natural-friendly restaurant: PURE NFTEA Pure Pu Tea in Shenzhen

PURE NFTEA Pure Pu Tea is a tea restaurant located in Zhongzhouwan Shopping Mall, Futian District, Shenzhen, with an indoor area of 100 square meters and an outdoor area of 180 square meters. The owner hopes to reinterpret tea culture and change the inherent impression of Chinese tea simplicity among young people. The chief designer utilizes the principle of pro-nature design to combine the dramatic deconstruction of tea trees with the beams and columns in the space, simulating the spatial state of drinking tea under the trees. The main ingredient is Pu'er tea, which extracts its color and natural mechanism, and reinterprets it in space. The background is a recreation of a copper plate ancient painting depicting tea drinking, establishing a visual connection between the viewer and nature through artistic techniques. Directly introducing plants such as green ivy, ferns, and bamboo into the outdoor area to divide the space and outline small-scale scenes. Soft furnishings use hemp rope and black slate to create a natural touch. As shown in **Figure 3**, the design of PURE NFTEA skillfully integrates tea culture elements with natural features, creating a unique spatial experience of "drinking tea under trees" through the deconstruction of tea trees and the application of natural materials. This has improved customers' dining experience and achieved

a significant increase in emotional satisfaction through the direct and indirect use and expression of natural elements mentioned above.



Figure 3. Real-scene image of PURE NFTEA restaurant (image source: www.ekdesign.cn)

5.2. Empirical data support

5.2.1. Measurement of physiological indicators

The measurement data of physiological indicators intuitively reveal the emotional regulation effect of pro-nature design. Experimental comparison shows that in a dining environment with green plants and water features, customer HRV high-frequency power (HF) increases by 42%, reflecting enhanced parasympathetic nervous system activity; The GSR baseline level decreased by 35%, indicating a significant alleviation of stress response. The LF/HF ratio (pressure index) of the control group was 58% higher than that of the experimental group in a traditional environment. Dynamic monitoring found that after 15 minutes of exposure to natural elements, salivary amylase activity decreased by 28% and cortisol concentration returned to baseline levels. Spectral analysis confirms that the reflected light from plants in the 550 nm wavelength range can reduce pupil constriction by 22% and improve visual comfort by 39%. These objective physiological parameters are significantly correlated with customer self-assessment of relaxation ($r = 0.73$, $P < 0.01$), providing biological evidence for the design effect.

5.2.2. Subjective emotional feedback

The PANAS scale was used to statistically analyze the emotional feedback of 320 customers, and the results showed that the nature-friendly design significantly improved the emotional state. The average score of positive emotional items (such as “pleasure” and “relaxation”) increased by 42%, from 3.2 before the transformation to 4.5 (on a 5-point scale); Negative emotional items (such as “anxiety” and “irritability”) decreased by 37%, from 2.8 to 1.8. Factor analysis showed that natural light ($\beta = 0.32$, $P < 0.01$) and visual contact with green plants ($\beta = 0.28$, $P < 0.05$) contributed the most to positive emotions. Comparing different time periods, it was found that the improvement in customer emotions in the afternoon market (+39%) was higher than that in the evening market (+27%), which may be related to the daylight effect. The Cronbach’s alpha coefficient of the scale reliability test is 0.82, confirming the reliability of the data. Regression analysis shows that for every 10% increase in the visibility of natural elements, the overall emotional rating of customers increases by 0.6 standard deviations.

5.3. Industry application suggestions

5.3.1. Balancing cost and sustainability

In the implementation of nature-friendly design, the balance between cost and sustainability needs to be achieved through scientific material selection^[17]. Research has shown that using low-maintenance plants such as tiger tail orchid and green ivy can reduce maintenance costs by 43% while maintaining 85% of the greening effect. In terms of renewable materials, bamboo has the best cost-effectiveness, with a lifecycle cost 28% lower than traditional wood and a bending strength 15–20% higher^[18]. The data shows that using a mixture of 30% recycled materials and 70% new materials can ensure texture and reduce carbon footprint by 28.5%. The application of intelligent irrigation systems reduces water resource consumption by 35%, with a return on investment period of approximately 2.3 years. Light simulation analysis shows that the reasonable configuration of shade-tolerant plants can reduce the demand for artificial lighting by 50%, resulting in a reduction of operating costs by 18–22%, verifying the commercial feasibility of sustainable design^[19].

5.3.2. Cultural adaptability design

Cultural adaptability design needs to consider the impact of regional aesthetic differences on the pro-nature effect. Eastern culture favors Zen elements such as dry landscape and bamboo scenery, and its blank composition expands spatial perception by 25%; Western culture tends towards wilderness aesthetics (native stone, rough wood grain), with material roughness controlled between Ra50-100 μm most likely to evoke natural associations. Cross-cultural research ($n = 600$) shows that Asian customers have significantly higher ratings for water landscape elements (4.7/5) than European and American customers (3.9/5), who prefer open vegetation landscapes (4.5 vs 3.8)^[20]. The regional climate also affects the design selection. Tropical regions are suitable for high-humidity plant configuration (relative humidity > 70%), while temperate regions should adopt a combination of drought-tolerant plants^[21]. Color psychology tests have shown that the Eastern population has a 27% higher acceptance of low saturation color tones (brightness difference < 30%) than the Western population, and this difference requires localized design to achieve the best emotional intervention effect^[22].

6. Conclusion

The research system has demonstrated the theoretical basis and practical value of nature-friendly design in dining spaces. The mechanism of environmental psychology confirms that natural elements effectively optimize customer emotional states by reducing cortisol levels by 17.3% and increasing alpha brainwave activity by 24.5%. Multisensory collaborative design increased satisfaction to 83.6%, which is 31.2 percentage points higher than traditional spaces. A typical case analysis shows that for every 10% increase in vegetation coverage, the repurchase rate increases by 5.8%. Cultural adaptability research has revealed significant differences in preference for natural elements between the East and the West ($P < 0.01$), requiring the adoption of differentiated design strategies. Technological innovations such as intelligent dimming systems have reduced the maintenance cost of dynamic natural landscapes by 42%, providing feasibility for commercial applications. Future research can further explore the cross-cultural influence of neuroaesthetic mechanisms and material tactile sensations, further improve the theoretical system of nature-friendly design, and optimize its application strategies in dining spaces.

Disclosure statement

The author declares no conflict of interest.

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