

THE WALL MURALS DESIGN EVALUATION FROM THE PERSPECTIVE OF PLANT VISUAL GRAPHICS

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ABSTRACT

Indoor plants bring people a lot of positive effects like heightening the positive emotions, raising attention, improving health and other effects. If we were to find out the proper mental element of plant visual graphics for people, they would bring users a banquet in mind and improve the aesthetic sensibilities. This research aimed to the user evaluation of different shape, color and technique of expression plant graphics.

The basic plant visual graphics characteristics included line, shape, density, color, texture and other characteristics. Among them, line created shape and texture, the relations between was closely linked. For this reason, the experiment samples of plant graphics was taken by "circle" shape common arbor tree in Taiwan and technique of expression were "simplifying drawing and geometric drawing," then did experiment with another variable of 5 bright pure colors changing. The experiment subjects were divided into two groups, designers (interior, landscape, commercial and other designers) and users, did experiment in a real space for letting them have the feelings of virtual situation. The evaluation items were natural, joyful, active, relaxed, fresh, vital, comfortable and like. The experiment results showed that "circle" tree shape's "simple drawing and green" visual graphics received high evaluation and "like" was an important key point in evaluation. We hoped to provide interior space a design guideline and a better environment for users' mental needs.

Keywords: *visual graphics, evaluation, wall murals design*

1. INSTRUCTION

The interacting with plants could help the present day people relax body and mind. Many researches confirmed that natural landscape would bring people positive effects. Even though just saw the scenery could help people relax and release the pressure. Being close to plants was not only good for both physical and mental, also changed people's emotion, pressure, attention, physiological responses, attitude and behaviors.

In the real life, not everybody or space was suitable for plants, there were many things to take care like moisture content, watering and other problems. For this reason, people used man-made plant, flower and plant wall murals and other ways to replace the real plants. The popular wall murals in recent years were various and easily creating a different atmosphere like traditional wallpaper. The research aimed to the effects of plant wall murals in different expression ways and colors. Trying to find out which expression ways could bring out people's positive, spirit and energy emotions more, also feel the joy, relaxation and comfort. The research result showed the higher evaluation expression ways and provided a resource for plant wall murals design.

2. REFERENCE AND REVIEW

The research was based on graphics, visual form, environment psychology and emotion references, also used them to support research assumption and experiment tools.

2.1. Graphics

Graphics meant structuring again and it was a subjective conscious. It could present some meanings or an expression combined with drawing, modeling and imagination world. In English, icon, figure, picture, image and other words all meant "graphics," they had the meaning of molding the surface form. In Chinese, graphics were easily made people confused with "painting, picture, figure, portrait and other words." From the above-mentioned point, graphics not only showed the meanings of outside world, also deep connected with target. It was a superficial form of visual territory from people and a subjective composition which could use any ways to show the concept. The research focused on the expression ways of graphics, not the reproduction of real things. In other words, we aimed to discuss the effects of different visual forms plant graphics.

2.2. Visual form

Graphics visual forms included dot, line, shape, model, color, texture and other characteristics, supplementary factors included space, time, direction, position, focus and other characteristics. People's cognitive ability to graphics would be different because of the visual elements' number or diverse expression ways. It would effect people's visual impression, physical and mental. The Bauhaus basic teaching concept was taken "modeling" as the foundation of every design work and it was a communication form of creation [1]. People's reaction to each modeling was instinctive. The modeling's unique shape and meaning were depended on the relation between entire and mold [2]. There were dot, line, surface and solid 4 types of modeling. The dot characteristics included size, measure of area and limit (outline), its dimension decided the shape and effected the feelings of weight, going

forward, falling back, distention and shrink. As an important factor of modeling, line types included curve, straight line, geometric line and organic line. Different line types gave people obvious dissimilar feelings. The basic surface types were square, triangle and circle. Square had hard, strong and weighty characteristics; triangle gave people simple, harmonious and sharp feelings; circle made people happy and warm.

Different graphics expression ways would bring out diverse visual impression. Simplifying image was one of the very popular expression way. Mayer & Laveson (1981) simplified the running processes of object drawing to abstract, according to the visual factors like line, shape, outline, color, texture and other factors. It was called level of stylization and figure 1 showed the process [3]. A Taiwanese savant used this contention and did legibility experiment, classified experiment samples into “complex drawing, simplifying drawing and geometric drawing” 3 types.

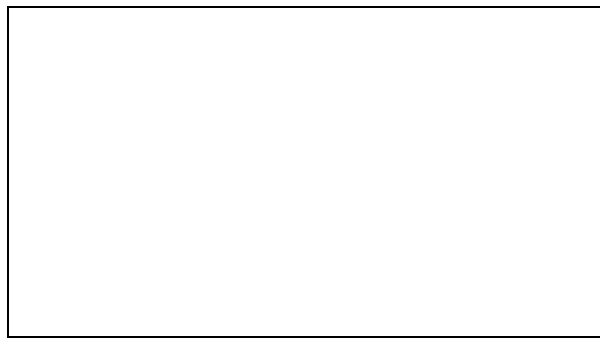


Figure 1: Levels of stylization by Mayer & Laveson

The colors of visual forms were classified into achromatic and chromatic colors 2 categories. Color included hue, value and chroma 3 attributes. Most people could easily recognize hue, but hardly recognize value and chroma. Many researches showed that people's color interaction degree was more sensitive than the degree of shape. In normal situation, color effected people's physical and mental both, gave more and stronger emotion effects than modeling [4]. Besides, the vision system research also showed the similar theory. Comparing with shape and movement, people noticed color in the very first time [5]. In graphics, colors brought out people's reaction most and felt different by age, sex and culture.

The research chosen colors and expression ways as visual forms' major evaluation items, also used shape psychology, color psychology and simplified theory as basic references for the next stage experiment.

2.3. Environmental psychology and emotion

Emotions were the first and immediately feelings of environment, it related to the coming minds, thinking, physical reaction, behavior and other reactions. Emotion experience was a part of consciousness process and it was like a feelings evaluation after people being aroused. Rodemann (1999) aimed to the wallpaper patterns and concluded the relations between graphics and reactions. For example, middle size flowers, soft geometric figures and plant figures would comfort impatient mood; middle to large size graphics with middle value colors would increase people's confidence and other instances [6]. Mehrabian and Russell (1974) created a rule-theoretic approach to environmental classification which based on the

environmental psychology and 3 important directions were “pleasure, arousal and dominance” [7].

The reason why people loved nature environment was the cure power relieving people’s pressure and attentional fatigue. In purposeful activities, people got attentional fatigue because of avoiding unfocussed situation, boring feelings and frustration when conquered wandering minds and maintained focus in class or studying [8]. Brain would release higher α brain waves after people contacting the nature environment, made people recover from pressure and attentional fatigue, also increased attention and relaxed mind. At the same time, the positive feelings of seeing nature scenery would affect memory efficiency, increase people’s cognitive ability and efficiency.

According to the above-mentioned points, emotion and performance effected people’s evaluations most. Different environment also effected people’s emotion, performance and attention. The research used emotion and performance as the experiment evaluation items.

3. METHOD

References were the basic of experiment and supported research assumption and experiment tools. Experiment tools included questionnaires and plant graphic samples. Questionnaires and samples were according to the pilot experiment results and research assumption needs [9]. The simulator space in wall murals experiment would increase the subject’s reactions. The experiment aimed to the emotional effects on graphics expression ways and the colors of plant graphics.

The graphics of samples referred to environment and landscape scholars’ research results. Figure 2 showed the shapes of samples were according to tree form examples by Booth (1990) [10]. Leaf density included the trunks of trees, branches and the size of leaves. The Color Science Association of Japan presented an “image scale of trees” which sorted trees’ shapes, branches and leaves density by light/heavy and cold/warm 2 directions (Figure 3) [11].

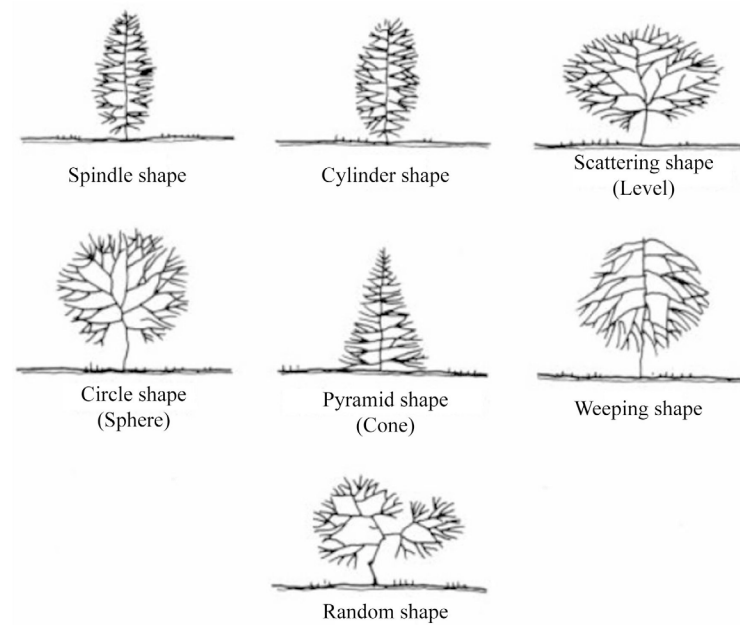


Figure 2: Tree form examples by Booth

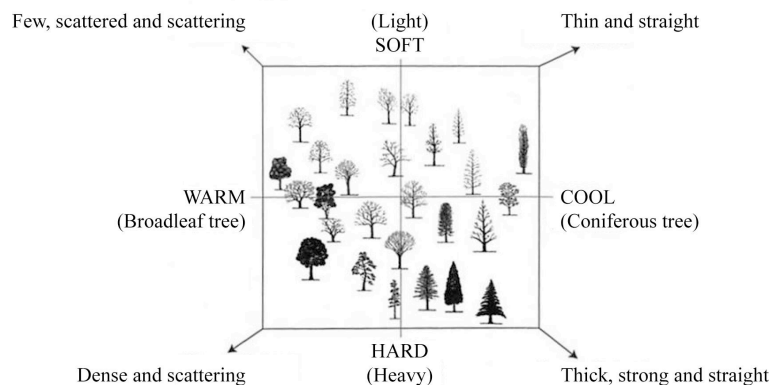


Figure 3: Image scales of trees

According to above references, the experiment set “circle” tree-form and “simplifying drawing and geometric drawing” 2 expression ways as plant wall mural samples choosing ways. The major 5 colors, “red (R), yellow (Y), green (G), blue (B) and purple (P)” of samples were different hue, bright value and pure. Table 1 showed 10 plant wall mural samples which made by 2 expression ways with 5 colors.

For the factuality of subjects’ emotional effects, the experiment took place at a 90.95 (10.6m long and 8.58m wide) space just like the normal room with wall murals and used 0.49m*1.2m partition to separate the space into 10 parts for 10 samples. The hues, lighting of experiment space and the materials, colors and styles of chair and other experiment tools in it all were chosen from the principles of basic and necessary display. Talking about the processes of experiment, first invited subject to the experiment space and followed the order of samples, then finished the questionnaires. Figure 5 showed the experiment space display and subject in the process of experiment. According to Daniel & Boster’s research result, the vision effects on emotions experiment, test running time should be unless 5 seconds and most

experiment time was 10~20 seconds [12]. The experiment here asked subjects should watch each sample unless 10 seconds then fill the questionnaire up.

Table 1: Plant wall mural samples (inside parentheses were CMYK codes)











	Red 5R 7/10 (20,60,61,3)	Yellow 5Y 8/11 (9,21,86,0)	Green 5G 7/10 (80,20,42,2)	Blue 5B 7/8 (71,26,14,0)	Purple 5P 7/9 (22,37,12,0)
Simplifying drawing	 Sample 1	 Sample 2	 Sample 3	 Sample 4	 Sample 5
Geometric drawing	 Sample 6	 Sample 7	 Sample 8	 Sample 9	 Sample 10



Figure 4: Experiment space display

A total number of 97 persons were recruited, among them, there were 41 male (42%) and 56 female (58%); while 51 of them were designers (53%) and 46 users (47%); then 53 of them were 18~25 years old (55%) and 44 of them were 26~45 years old (45%). The 8 evaluation items of emotions were the degree of “nature, positive, freshening, vigor, joy, relaxation, comfort and like (Table 2).”

Table 2: Evaluation items

The feeling of plants	The degree of like	The degree of emotional effects on environments	
		High arousing evaluation items	middle/low arousing evaluation items
Naturally	Liked	positive, freshened, vigorous	joyful, relaxed, comfortable

4. RESULTS AND DISCUSSIONS

Through statistics test, it is known that the average of all samples (Table 3). According to the average of all samples, every sample received over middle grades 0, but Sample 5, which might be because most subjects gave plant wall mural samples positive evaluations. Among them, Sample 3 received highest evaluation (1.02), followed by Sample 8 (0.87) and Sample 9 (0.7), whereas Sample 5 received lowest evaluation (-0.08), followed by Sample 10 (0.07) and Sample 1 (0.24). Generally, all subjects gave each evaluation item of Sample 3, Sample 8 and Sample 9 high grades (Figure 5).

Table 3: Evaluation scale

Degree	Very object	object	No comment	Agree	Very agree
Score	-2	-1	0	1	2

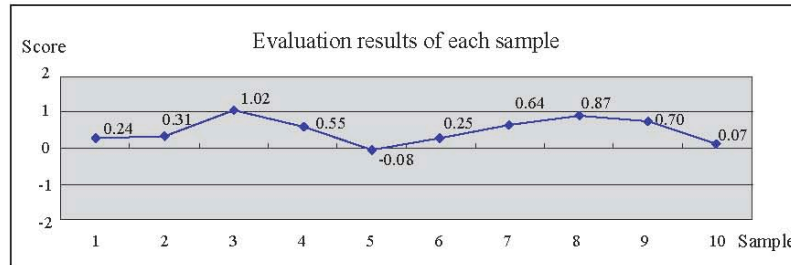


Figure 5: Evaluation results of each sample

According to the average result of each evaluation item's color, all 5 evaluation colors received over middle grades 0; subjects thought green and blue were nature, also their favorite colors. Green graded higher than other colors in all evaluation items and the degree of nature received highest evaluation. Blue graded over middle grades 0 in all evaluation items and the degree of comfort received highest evaluation. Red, yellow and purple graded under middle grades 0 from the degree of nature. It could be noticed that low relevancy between these 3 colors and plants (Figure 6).

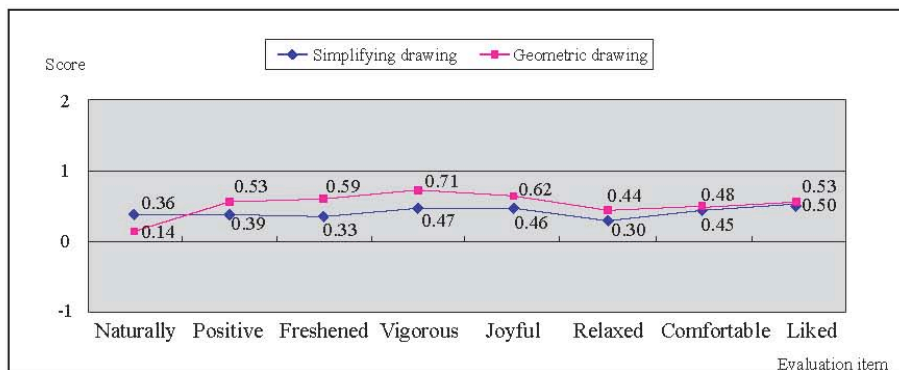


Figure 6: Averages of each evaluation sample's expression way

Speaking of the degree of emotional effects, green and blue received higher evaluation from joy, relaxation and comfort 3 middle/low arousing evaluation items. Blue received lower evaluation than green and under grades 0.5 from positive, freshening and vigor 3 high

arousing evaluation items. Red and yellow received higher evaluation from high arousing evaluation items, but received lower even negative number from low arousing evaluation items. Purple received negative number from high arousing evaluation items and received low evaluation with positive number from middle/low arousing evaluation items. There was no particular high or low average grade from all evaluation items. It could be noticed that low relevancy between purple and plants, it was a color that hard to evaluate.

Through one-way ANOVA, green and blue received higher evaluation than other colors from nature, relaxation and comfort. Purple graded lower than other colors, only received higher evaluation than red from relaxation and comfort evaluation items. Red and yellow graded higher from positive, freshening and vigor, graded lower than green and blue from relaxation and comfort. Speaking to evaluation items, the difference between the maximal and the minimal grades was big in the degree of comfort, green and blue were more comfortable colors, red was the most uncomfortable. There was no significant difference between each color's evaluation results of joy.

According to correlation coefficient results, positive correlation is found between the degree of nature and the degree of like; extremely high positive correlation also seen between the degree of joy, relaxation and comfort 3 low arousing evaluation items. Additionally, positive correlation is found between the degree of joy and other evaluation items; extremely high positive correlation also seen between the degrees of nature, freshening, relaxation, comfort and like. Extremely high positive correlation is found between positive, freshening and vigor 3 high arousing evaluation items.

Next, the research did factor analysis to evaluate 8 evaluation items by principal component analysis and find out the main factor of subject's emotions, Table 4 showed the evaluation results. There were 2 major evaluation factors. First factor group included comfortable, relaxed, naturally, liked and joyful, their contributions were the highest and comfortable presented this group's factors most. Second factor group included vigorous, positive and freshened, the contribution here was secondly and vigorous presented this group's factors most. The cross validation results of 2 factor groups and correlation coefficient showed that first factor group factors were middle/low evaluation items, like and nature also belonged here. It could be noticed that the relevancy between the degree of like, nature and middle/low arousing evaluation items was high, influenced each other more; but the relevancy was lower with second factor group. Second factor group factors were high arousing evaluation items and the relevancy was low between like, nature and them.

Table 4: Evaluation results of each factor

	Factors	
	1	2
Comfortable	.890	
Relaxed	.876	
Naturally	.774	
Liked	.738	.327
Joyful	.704	.406

Vigorous		.881
Positive		.864
Freshened	.193	.810

5. CONCLUSIONS

5.1. Visual form of plant graphics

According to expression ways, subjects graded higher in “simplifying drawing” graphics. It might because that simplifying drawing had curve line characteristics of organic line and it was similar to the line of nature plants. “Geometric drawing” graphics gave people positive and vigor feelings more. Based upon all samples, there was no significant difference between simplifying drawing and geometric drawing. Speaking of the colors, “green” received the highest evaluation and it was people’s favorite graphic color. Subjects graded highest from the degree of nature, it could increase the feelings of joy, comfort and relaxation, also be positive, freshening and vigor.

As above-mentioned, colors influenced the plant wall mural evaluation more and it was an important factor to plant graphics. Therefore, it can be concluded that people should consider the colors effects on plant graphics in the first place while plan the wall mural in a space.

5.2. Evaluation variables and subjects

All subjects liked and graded high samples almost the same, it showed the common sense of receiving high evaluation plant graphics. In term of the subject groups, there was no significant difference between different sexes from color evaluation, but female differentiated between different colors more sensitive than male. It could be concluded that taking female’s advises was a top priority while start a color design plan. Designers differentiated few samples more sensitive than users and there was no significant difference between other groups.

In terms of joy, comfort and relaxation 3 middle/low arousing evaluation items, they were high relevancy with the degree of nature and like. It could be noticed that people liked plant graphics made them joyful, relaxed and comfortable, also felt the nature more. Speaking to the vigor, positive and freshening 3 high arousing evaluation items, they were high relevancy between each other, but low relevancy with low arousing evaluation items. In all evaluation terms, it was high relevancy between joy and other evaluation items, significant relevancy with the naturally, vigorous, relaxed, comfortable and liked. It showed that joy was an important evaluation item in the effects evaluation. As above-mentioned, “joy” was an important evaluation item of plant graphics evaluation. It could be noticed that if the joy feelings in graphics increased, it could enhance people’s evaluation to plant graphics.

5.3. Evaluation results

According to experiment results, it showed that the major evaluation item of plant graphics was “joy” and whether people felt joyful, relaxed and comfortable effected on the degree of “like.” The visual forms’ colors influenced the plant graphics evaluation the most, among

them, “green” received highest evaluation. “Simplifying drawing” gave people strong feelings of nature and “geometric drawing” gave positive and vigorous feelings. In a word, using simplifying drawing expressed plant graphic wall murals with green color could enhance the evaluation of joy, relaxation, comfort, positive and freshening, also give people positive effects and easily feel the nature by graphics.

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