The Effect of Color Guidance on Design Communication

Yu-Chia Chen[1], Bo-Lun Wei[11] and Ming-Shih Chen[111]

[1] National Taiwan University of Arts,Department of Visual Communication Design

t0329@mail.ntua.edu.tw

[11] Tunghai University, Department of Industrial Design

jjdavid330@yahoo.com.tw

[111] Tunghai University, Department of Industrial Design

msc@thu.edu.tw

ABSTRACT:

Graphic design contains three basic elements: color, graphic and text. Among these, color performs the functions of communication, identification, and symbolization. Drawn from the author's teaching experience in design, it is observed that design students often over-emphasize on the meaning of graphics and text while neglecting the functions of color in design. They also tend to make subjective judgments of design colors which affect the interpretation and communication of their own design.

Therefore, this study aims to identify the rules of colors applied in creative graphic design and how colors could cause people to have mental connection to certain images. Through strengthening the explanation and appeal element by increasing the communication and function of a colored creation to make it has higher effect on people.

This research was conducted by an experiment based on the function of color. First data about the symbolic meanings and the connecting characteristics of colors were collected. Then a process for "Color Image" creativity guidance was proposed and the guidance rule was used to conduct a design creativity experiment. Rating method was employed to evaluate the communication effects based on the data obtained from the experiment results. Finally, it confirms about the efficiency of "Color Image" creative guidance.

Keywords：Color, Communicative Effects, Visual design

1. INTRODUCTION AND PURPOSE

"Color" in visual design has identification and functionality which influences the users' cognition of the design message conveyed. Therefore, the designer should not only choose colors with subjective feelings and personal preferences but also be objective in color application. In fact, among the elements of visual design, graphic and text are inseparable from color performance. In excellent design work, symbolic meanings and psychological characteristics of color are usually considered and convey design meanings and significance corresponding to specific themes.

People are very sensitive to the perception of color. Color is the strongest element among visual effects, followed by graphic and text. Therefore, this study, based on findings from the literature with practical experience in design and the purpose of this study, proposes "Color Guidance" experiments to direct creativity. Advocates that in the design process, the priority is to grasp the characteristics of color (for example : color associations and symbols, color psychology, and the sensations and perceptions of color, color images, etc.) to inspire creativity, then finish the visual design by connecting it with graphic and text. It is Sought to make the conveyed content and color image consistent and actively guide users into the content connoted by the graphic and text message with color. And expecting to enhance young designers' ability of color application and improve the communication in visual design.

This empirical study aims to guide creativity with color image and to discuss the "color guidance method" has positive effects on design communication. During the first stage, experiments were run in accordance with the procedures through the production of the original works of the experiment. In the second stage, further surveys of the experiment were carried out to verify the effectiveness of the experiment. The results of the research were expected to provide references in the process of creativity for design education and industry.

2. "COLOR GUIDANCE METHOD" EXPERIMENT

2-1 Purpose and method

Purpose: This experiment has created a systematic and planned teaching guidance method to prompt designers to actively combine color image into the visual design theme during the creative process. This guidance does not only cultivate the designer's ability to observe and analyze but also increase their understanding of color so as to apply color in inspiration of design creation through the psychological factors of association.

Method: The subjects in this study were divided into two groups: experimental group and control group. The experimental group used the "color guidance" to experiment guide-creation while the control group was left to create freely. The experiment lasted for five weeks for five weeks.

Subjects: They were high school third-grade design students. Both groups have already studied color theories.

Procedure: The guidance involved three steps: (1) color conceptualization (2) theme structuring and (3) visualizing creativity.

2-2 Experiment

Step 1. Color conceptualization

First of all relevant knowledge for color (color associations and symbols, color psychology, color sensations and perceptions, color images, etc...) were reviewed and discussed followed by associating the design and theme-related words. The target design merchandise was set as "mobile phone", of which the distinguishing features were synchronized image/sound, unrestrained happiness etc... Target users were young people between 10-20 years old so the design theme was set as "fun". Each design student then wrote 10 phrases corresponding to the text topic "joy image". The 10 most common entries in the result were sorted in the following order : amusement parks, balloons, stones, fireworks, clowns, musical notes, eating, children, dogs, electric, cake, artists, ribbon, McDonald's, a rainbow, flowers, television etc..

It could be observed from the color matching exercise that the majority of students in this step applied color characteristics well on the "joy" image. Collocations were mostly applied colors with high-saturation, multi-hue, warm, contrast hue and so on. Shapes were mostly expressed in free-form curves, radiating figures, and irregular arrangement.

Step 2. Theme structuring

Through guidance, subjects conceptualized color images, stored colors in the mind and further structured their creativity by focusing on the design theme from different perspectives, feelings and impressions to stimulate ideas. Present information was integrated with creativity so creativity could be put into practice more effectively. The information of purpose of design, product

attributes, brand image were analyzed and theme color data were gathered from the previous step.

Through this process, each student considered the theme context with a different perspective, impression and feeling. Finally, by integration, transformation and diffusion, they found the most potential ideas.

Step 3 Visualizing creativity

The third step was to review design strategy requirements. By screening, similar themes and expressions which were excessively different from the theme were removed. After organizing and concluding, specific ideas and color schemes were presented. Based on the hand-drew draft, subjects used graphics software (Photoshop, Illustrator) to add font text, merchandise, signs, and other relevant information to complete the design work.

2-3 Results

Guiding creation with the "Color guidance" experiment enables students to objectively choose colors, clearly grasp the design theme, and be further stimulate for the theme-associated images. The characteristics of the works of both the experimental group and control group, with the same design strategies and time, are presented in Table 1:

Table 1, Theme and color characteristics of the two groups

Work	Experimental group	Control group
Color	・ Mostly high-saturation, multi-hue, warm	・ Color expressions disordered and mostly in cold colors
Theme	・ Grasps the theme more easily, less strayed from theme 。	・ More easily to be strayed from theme ・ Overall performances low integrity.

By observing the experiment process and referring to the integral works in the three-step guidance in the "color guidance" experiment, researchers found that through word association, color matching exercises, image stimulation, students have showed the following changes. The guidance s a step-by-step procedure which emphasizes in planning so that students could grasp the connection between the theme and colors, and come up with ideas faster. Simultaneously, during the guidance process, the students are inspired from the interaction of each of the data gathered which does not only make it easier for them to grasp the theme direction but also enhances confidence in their creation process, and reduces the level gap between students.

3. Communication effect survey

3-1. Purpose and Methods

Purpose: By issuing the "color guidance" experiment in this study, we aimed to enhance designers' color application ability and that they could apply colors to effectively convey the message of the design theme. However, to verify our results, the works generated from the experiment should be evaluated by users. Therefore, we proceeded to the "communicative effect survey" phase to compare the differences in communication effects between the experimental group and the control group.

Subjects: Subjects were divided into design professionals and non-design professionals so as to compare the differences of the experimental group and control group from the findings of the survey.

Samples: Works of the experimental group and the control group were screened in two stages: the ones which were unsuitable to the theme or unfinished were removed then the works were scored with grade A , B or C. Ten pieces of works of each group were chosen from the total of 20 samples.

Items: Survey items, according to the visual design effects level model and the three aspects of measuring the users' attitude, 1. cognitive 2. Emotional 3. intention, are as follows:
(1) Can you understand the design of the message?
(2) Is the design creative?
(3) Can you feel the expression of the "Joy" theme?
(4) Is the design impressive?
(5) Do you like the design?

Questionnaire Design: Five assessment items were presented in this questionnaire using the Likert-type Scale, adopting positive scaling. After discussions of pre-investigation, the wordings of the scale are amended as shown in Table 2 :

Table 2, Scale level comparative table

Scale	1	2	3	4	5	6	7
Item wording	extremely disagree	strongly disagree	disagree	undecided	agree	strongly agree	extremely agree

3-2 Results

168 questionnaires were returned in the survey. Excluding the unanswered or incomplete ones, 143 of them (85%) were valid. Based on the survey results, an overall average of all subjects' score for the 20 samples was calculated which is shown in Table 3:

Table 3, Average score of each sample

group	item	quantity	minimum	maximum	average	standard derivation
Experimental group	01	143	3.84	4.96	4.44	0.4012
	02	143	4.89	5.57	5.28	0.2585
	03	143	4.68	5.11	4.89	0.1650
	04	143	4.81	5.55	5.24	0.2712
	05	143	4.44	5.28	4.82	0.3458
	06	143	3.97	4.89	4.51	0.2499
	07	143	3.84	4.94	4.39	0.3810
	08	143	4.65	5.71	5.24	0.3563
	09	143	5.17	5.97	5.69	0.2505
	10	143	4.77	5.38	5.09	0.1890
Control group	11	143	3.32	4.53	4.01	0.4495
	12	143	3.29	4.55	4.02	0.4376
	13	143	3.03	4.17	3.61	0.4050
	14	143	3.66	5.04	4.51	0.4565
	15	143	2.96	4.25	3.67	0.3998
	16	143	3.75	4.56	4.15	0.2750
	17	143	4.12	5.03	4.54	0.3339
	18	143	3.94	4.91	4.37	0.3327
	19	143	3.77	5.08	4.37	0.3885
	20	143	2.97	4.97	3.98	0.7226

Table 3 includes all answers of the subjects' maximum, minimum and average of the samples. Sample 1-10 are from the experimental group which samples 11-20 come from the control group. On the whole, the score is mostly distributed between scales 3-5 which reflects that all subjects' assessments are between positively agree and negatively disagree. The three samples with the highest evaluations are 09, 02 and 08which all come from the experimental group with a respective average score of 5.97, 5.71 and 5.57. The three samples with the lowest evaluations are 13, 15 and 20whichall come from the control group with are spectively average score of 3.61, 3.67 and 3.98. The actual samples of the design works are illustrated in Figure 1:
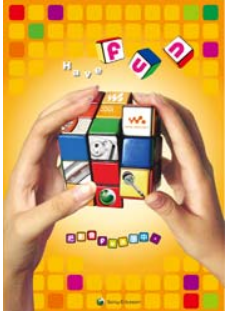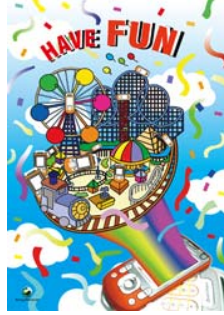
	NO.1	NO.2	NO.3
High evaluation (All of them are Experimental group)	 sample09	 sample08	 sample02
Low evaluation (All of them are Control group)	 sample13	 sample15	 sample20

Figure 1, High evaluation and Low evaluation

Then the distribution map average curve was further analyzed as presented in Figure 2:
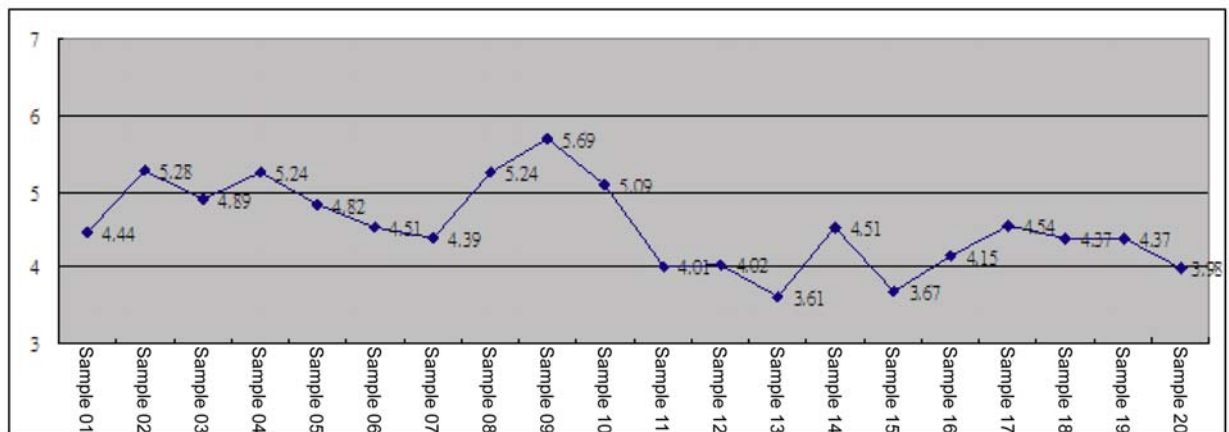

Figure 2, Distribution map of samples

Figure 2 shows the distribution map of all three samples' average. Sample 1-10 are from the experimental group while 11-20 are from the control group. As can be seen, most subjects give a higher evaluation on the works of the experimental group than that of the control group. The scale distribution of the experimental group distribution is between 4-5 whereas the scale distribution of the control group is between 3-4. In other words, the overall performance of the experimental group is better than that of the control group.

The average score of the five assessment items are shown in Table 4.

Table 4. Average of five assessment items of each visual design samples

(italic：MAX；underlined: MIN)

Item		Comprehensibility	Creativity	Theme expression	Impression	Preference	Average
experimental group	01	4.03	4.59	4.66	4.63	4.32	4.45
	02	5.35	5.31	5.30	5.16	5.28	5.28
	03	5.11	4.85	4.99	4.70	4.81	4.89
	04	5.20	5.20	5.51	5.32	5.00	5.25
	05	5.18	4.75	5.20	4.50	4.46	4.82
	06	4.70	4.71	4.48	4.45	4.21	4.51
	07	4.55	4.22	4.91	4.16	4.13	4.39
	08	5.21	5.28	5.65	5.03	5.03	5.24
	09	5.38	5.86	5.67	5.80	5.73	5.69
	10	5.02	5.11	5.14	5.17	5.02	5.09
Control group	11	4.38	4.02	4.38	3.54	3.74	4.01
	12	4.37	4.36	3.51	4.19	3.68	4.02
	13	3.87	3.67	3.55	3.51	3.46	3.61
	14	4.87	4.56	4.57	4.38	4.16	4.51
	15	4.22	3.75	3.76	3.38	3.24	3.67
	16	4.41	4.40	3.97	4.07	3.90	4.15
	17	4.80	4.44	4.97	4.28	4.24	4.55
	18	4.85	4.19	4.15	4.43	4.22	4.37
	19	4.95	4.30	3.98	4.33	4.29	4.37
	20	4.58	3.73	3.81	4.15	3.62	3.98
MAX		5.38	5.86	5.67	5.80	5.73	5.69
MIN		3.87	3.67	3.51	3.38	3.24	3.61
Average		4.74	4.58	4.61	4.47	4.34	4.55

Overall, the experimental group scores higher than the control group in each assessment item in which sample 09 has the highest average among the five and has the best overall performance. The one with the lowest comprehensibility and creativity is sample 13 and the lowest in theme expression is sample 12. The most unimpressive and most least preferred work is sample 15.

Analysis based on the average curve of the five assessment items of the two groups `is shown in Figure 3:
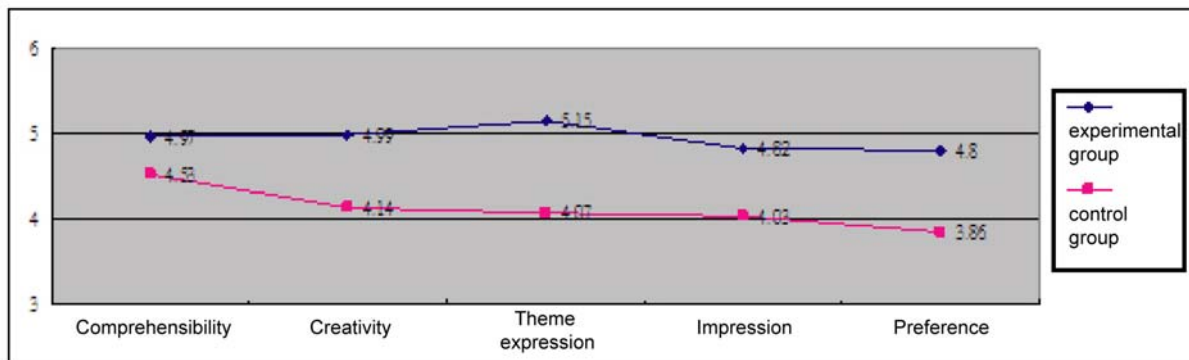

Figure 3, Assessment averages of the five items of the two groups

In this figure, the curve with the ◆ symbol represents the experimental group (sample 1 to 10) while the curve with the ■ symbol is for the control group (sample 11 to 20). From the average scores of the five assessments, the ◆ curve is above the ■ curve in every item which means that the average score of the experimental group is higher than that of the control group and its overall evaluation is in general better.   Among all the assessment items of the two groups, their scores are at the closest in the comprehensibility item which means the subjects think that they are able to understand the design message. The differences in scores for the theme expression and preference items are more obvious which show that the subjects consider the theme expression of the experimental group is better than that of the control group and that they prefer the works from the experimental group.

To understand the correlation of the five assessment items, we will now discuss the correlation coefficient of each item as shown in Table 5:

Table 5, Correlation of the five assessment items

	Comprehensibility	Creativity	Theme expression	Impression	Preference
Comprehensibility Pearson correlation Significance(two-tailed) quantity	1.000 . 20	.791** .000 20	.770** . 20	.793** .000 20	*843 .000 20

Creativity Pearson correlation Significance(two-tailed) quantity	.791** .000 20	1.000 . 20	.859** .000 20	.896** .000 20	.956** .000 20
Theme expression Pearson correlation Significance(two-tailed) quantity	.770** .000 20	.859** .000 20	1.000 . 20	.796** .000 20	.886** .000 20
Impression Pearson correlation Significance(two-tailed) quantity	.793** .000 20	.896** .000 20	.796** .000 20	1.000 . 20	.920** .000 20
Preference Pearson correlation Significance(two-tailed) quantity	*843 .000 20	.956** .000 20	.886** .000 20	.920** .000 20	1.000 . 20

**when the significance level reaches 0.01 (two-tailed), correlation significant

From the table above, the assessment items show high correlation and all five items achieve a significance level of 0.01, determined a two-tailed significance. Table 8 shows that the highest correlations are all correlated to preference and shows high correlation which means the subjects' evaluation are affected by preference. Looking into its cause, the result may be correlated to the average age of subjects, whose average age is 23 and 63% of them are high school students. Subjects' characteristics at this stage are distinct and have stronger subjectivity. The correlation between creativity and preference is almost entirely correlated which shows that designs with more creativity are more preferred by the subjects.

Table 6, List of the highest correlation coefficient items

Survey assessment	Highest correlation	Correlation	Correlation level
Comprehensibility	Preference	.843**	Highly significant
Creativity	Preference	.956**	Highly significant
Theme expression	Preference	.886**	Highly significant
Impression	Preference	.920**	Highly significant
Preference	Creativity	.956**	Highly significant

T-test was conducted for the five assessment items of the tow groups. (the experimental group and control group as grouping variables)

P value of the Levine test with equal variance was more than 0.05 so the P value is not significant; assuming variances are equal, the P value of the t-test which tests if the averages are equal is less than 0.05. The result shows that during the creation process of visual design, through the guidance of the "color guidance" experiment, performance of students in the experiment group and the control group have distinct difference. This also implies that using the "color guidance" experiment to guide the visual design process is helpful to enhance the learning efficiency of students and their work expressiveness. It also improves the outcomes of visual design conveyance and helps teachers to achieve the teaching objectives more successfully. Independent samples t-test of all samples(professional background as grouping variables)

From the P value of the Levine test with the equal variance, the P value of preference is less than 0.05, showing that preferences in the two groups have significant differences.

Assessment items

From the assessment items, all subjects gave both groups positive evaluation. The scale distribution is between 4 .33-4.75 with very little differences. The gap is less than 0.5, meaning that the subjects think that the works from both groups show comprehensiveness and stable performance in the five assessment items.

Comparing the average scores of five assessment items of both groups, the average scores of all items of the experimental group are higher than that of the control group which show that the subjects have higher evaluation on the experiment group. Subjects consider works from both groups comprehensible but that the experimental group has better theme expressions and they mostly prefer the works of the experimental group.

From the correlation between assessment items, in the experimental group, comprehensibility and theme expression are highly correlated. This shows that the more consistent the work is to the "joy" theme, the more comprehensible it is. Comprehensibility, theme expression and impression have the highest correlation with preference which shows that more creative and matching with the "joy" theme a piece of work is, the easier it is to gain good impressions.

Subject background

Overall, from the design professionals' and non-design professionals' attitudes and evaluations towards the samples, our study shows that design professionals have distinctive evaluations on each sample. It is also found that design professionals are trained to see the advantages and disadvantages of the works whereas non-design professionals are not as sharp as the professionals in this aspect and show a smaller difference among the scores given.. f the samples and have smaller score gaps. Furthermore, most design professionals gave the visual design samples worse evaluations than the non-design professionals. One possible explanation for this may be that these professionals generally have higher standards in design work and therefore evaluate the works more strictly and gave relatively worse evaluations.

From the assessments items, both design professionals and non-design professionals gave higher evaluation on the experimental group. The three highest evaluations in both subject types are all from the experimental group while the three lowest evaluations are from the control group. This shows that the experimental group has better overall performance. Among both subject types, there is little difference in the evaluation of the works of the experimental group and the average scores received are very close meaning that both subject types favor the experimental group' works. The evaluations of the control group are relatively low and show greater differences as design professionals and non-design professionals have different thoughts of the control group works.

Judging from the correlation between the assessment items, for the design professionals, the comprehensibility, creativity, theme expression and impression of a design work are all effected by preference. In other words, preference effect the design professionals' evaluations most. For the non-design professionals, visual designs which are creative and easily understood are more appreciated and impressive. Furthermore, theme expression is effected by creativity, which means the better the work can grasp the theme is grasped, the more creative it seems.

4. Conclusion

Guiding through the "color guidance" experiment, this research is set to understand the influences of color image in communicative effects by connecting design creativity with color image and conducted an empirical survey to verify the effects of the "color guidance" experiment.

Our analysis from the comparisons above shows that the experimental group's works are better evaluated than the control group\s works in communicative effects which proves that the "color guidance" experiment is helpful and has positive effects in communication. Systematic and planned teaching guidance methods help designers to grasp the theme of the visual design and to choose colors effectively in order to appropriately express the context and image objectively by actively combining color image and visual design features. The guidance results in a better overall design performance and communicative effects than those who design freely.