

# AN INVESTIGATION OF COLORIFIC SENSITIVITY IN DIFFERENT BACKGROUNDS

Teng, Pei-Shan <sup>1</sup> and Dengchuan Cai

<sup>1</sup>Graduate School of Design, National Yunlin University of Science and Technology  
pst525@ms68.hinet.net

Department and Graduate school of industrial Design, National Yunlin University of Science and Technology. caidc@yuntech.edu.tw

## ABSTRACT

The increased in popularity of the Internet in the recent years has dramatically altered the lifestyle of people today. In the digital era, digital learning、online games、digital video and other digital medias have become part of lives for college students, and therefore let the youth have more opportunities to experience digital environment.

The freshman classes of designing related field of various colleges in Taiwan mostly come from two types of learning background, a regular high school system or a vocational school system. Of the two, the students in the vocational system encounter color training courses earlier than the traditional high school students. According to literatures, understanding and ability to judge of colors are dependent of student's sensitivity toward colors as well as learning process. Therefore, to students submerge long term in a color environment; does it aid them in understanding of

digital color? In addition, the early offering of courses in color of vocational school, does it give students an advantage in ability to judge when compared to regular high school students? These are what this research will attempt to reveal.

This research is aimed at students in designing major that entered college via the two different learning backgrounds, and uses questionnaires to determine students' sensitivity toward colors. The results showed: 1. In regards effect of learning background have on color judgment, in general, students with regular high school background are better than those of vocational background. 2. Internet environment is beneficial to students' learning attitude toward color. 3. Under long term contacts with the Internet, the students have higher demands on color quality, thus also beneficial toward willingness to learn color.

**keyword: digital color, color difference, sensitivity.**

# 1. PREFACE

## 1. 1. Introduction

The development of the Internet and multi-media, stimulated the development of digital imaging and color, and it has rapidly become the main communication mediums of the informational society. Youth in Taiwan today spent more and more times in contact with the color environment of televisions and computers. Therefore, under the long term contact with the color environment, can it help to attract more youths to come to understand the color study?

College education is the foundation of educating a country's future assets. Currently in Taiwan, college students mainly come from two types of learning backgrounds. One is regular high school and the other is vocational school. The scholar プロフィール (1975) noted, age and development of color sensitivity are closely related to each other. The improvement of observation through high school will impact the usage of color. Most of the students entering designing related major have to go through courses in basic color, so those students without prior exposure to color courses can understand them. Accordingly, the teachers of these courses must also respect that there are two different levels of students when designing and teaching these courses.

This research will probe the sensitivity and understanding toward color by the college students today, to better understand in digital color environment, how sensitive the college students are to color and how they utilizes them. The main purposes of research are as followed:

1. Understands the level of color recognitions of the two types of high school educations.
2. Understands the attitude of college students toward color study.
3. Is Internet environment beneficial toward color study?

Among all of the living creatures, human's perception toward color is perhaps the most sensitive. In general, digital colors are the 256 colors that are made up of the 8 bits pixel; 24 bits pixel can display 16 million colors. Bit determines the dynamic range of color and darkness of an image,

then uses each pixel to display different color and darkness to show the visual image. This is the principle of digital color imaging to people.

In related research about acuity, R.S. Bridger(1995)proposed the theory about color and sensitivity, stating that when observing a stationary object, and the object is blue in color, the acuity is at the lowest. Also, Long & Gravey(1988) investigated the relationship between the sensitivity of color and motion. The conclusion suggested that user does not need to overly dependent on artificial color; instead, under enough light, to a display or observer in motion, the blue color can aid the sensitivity.

Speed of Perception means that after an image had appeared, the speed that the image gets to the brain, and is measure by visual reaction time. Typical average speed of perception is 0.2 seconds (I Chen Chang, 1998). In a bright environment and clear contrast condition, the speed of perception is faster. Speed of perception is an important factor that effects reading and studing.

## 2. RESEARCH PROCEDURE AND STEPS

### 2.1 RESEARCH SUBJECTS

Subjects are college sophomores in designing related major, with average age of 20 years old. According to the research methods, the subjects are divided by their pre-college educational background in group A and B. Group A has regular high school background with 35 members, group B has vocational school background with 25 members. The total number of subject is 60, and all must attend the basic color course for 1 semester. The demographic of the subject is 31 males, 29 females.

### 2.2 Experiment

Computer operating method. All of the computer screens were properly calibrated with calibration machines before experiment. The test was conducted under optimal brightness for reading and 45cm from the screens. The process was random appearance of RGB test sample on screen, the follow by simulating the same color sample through color combining tools on computer. The simulated color numeral was then recorded. Choosing the three primar of RGB is the basic color without mixing.

| Color tested |  |  |         |  |  |         |  |  |
|--------------|--|--|---------|--|--|---------|--|--|
|              |  |  |         |  |  |         |  |  |
| R            |  |  | G       |  |  | B       |  |  |
| 1. R255      |  |  | 1. G255 |  |  | 1. B255 |  |  |
| 2. R196      |  |  | 2. G196 |  |  | 2. B196 |  |  |
| 3. R93       |  |  | 3. G93  |  |  | 3. B93  |  |  |

Chart 1. testing sample

### 3. STATISTICS AND ANALYSIS

#### 3.1 Assessment

The result on chart 2 was subjected to T-test, under different educational backgrounds, the color of R2、R3、G3、B1 and B5 showed a clear difference under the two different learning experiences. Its corresponding values are: .00、0.00、0.00、0.22、0.34 <0.05, indicates that there is a difference in ability to discern colors between the two different educational backgrounds. Under the RGB color comparison, the students all have higher discernment rate toward pure color over the others, of which, the discernment of Green color is weaker when compared to other two colors. According to Theory about color and sensitivity of S. Bridger(1995), which stated the Blue color should have lower acuity, this experiment showed that Green color has the lowest acuity.

|    | t      | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
|----|--------|-----------------|-----------------|-----------------------|
| R1 | .801   | .426            | 1.863           | 2.326                 |
| R2 | 4.746  | .000            | 18.528          | 3.904                 |
| R3 | 4.858  | .000            | 17.832          | 3.671                 |
| G1 | -.324  | .747            | -1.026          | 3.168                 |
| G2 | 2.034  | .046            | 6.637           | 3.263                 |
| G3 | 3.917  | .000            | 17.670          | 4.511                 |
| B1 | -2.349 | .022            | -6.278          | 2.673                 |
| B2 | .808   | .422            | 4.909           | 6.077                 |
| B3 | -2.176 | .034            | -11.627         | 5.344                 |

Chart 2. Color discernment difference between students of Group A and B.

In the descriptive statistics, students of both educational background tends to spend times on Internet, with 71.7% of them spent at least 5 hours each day in front of computer monitor. As for

reasons to use Internet, 65% likes to view video and pictures, 63.4% likes to play online/PC games. 81.6% of the students like to use imaging software to edit the digital pictures. As for views toward digital colors, 80% of them feel not acute enough, however, 68.3% expressed they can not accept deviation of color usages on the Internet. 83% of the students feel color study will have great effect in lifestyle.

From these results, we can see that students without formal color training have the basic color discernment ability and requirement, as the result from the long term exposure to the digital color environment. For those students with early exposure to the formal coloring training, can still retain the basic standards even when they have not utilizes those color for a long time. For students in communication design majors, the familiarity of colors will need to be continuously improved.

#### 4. CONCLUSION

This research investigated 60 college students with different educational backgrounds to determine if the color judgments and Internet environment are beneficial to color study. The results indicated:

A. Students with the different educational background, shows clear difference toward the five colors of R2、R3、G3、B1、B3; that those with regular high school background and no previous color training has a higher accuracy in color judgments compared to vocational students with prior color training.

B. Regards to color learning attitude, most of the college students spent long time on Internet activities, such as web video, pictures, online games and etc. They also feel colors have a large effect on their lifestyle, and also have high demands to color usages on Internet.

C. The statistical results indicated the Internet has great effect to the students of today. Because there are actual applications such as video editing, making greeting cards, so that even without formal color trainings, students still have high aptitude toward color applications.

Internet has become an integral part of collage lifestyle today, and provided many new teaching methods in terms of actual applications. This research was geared toward students with different educational backgrounds, to provide reference toward color teaching and Internet applications.

## REFERENCES

Long GM, Garvey PM. (1988) The effects of target wavelength on dynamic sensitivity under photopic and scotopic viewing. Human Factor.

Chedkin,L. (1954) How to Color-Tune Your Home, Macmillan, New York.

R.S. Bridger (1995) Introduction to Ergonomics, Mc Graw Hill.

Hawjeng Chiou (2000) Quantitative Research and Statistical Analysis in Social & Behavioral Sciences, Taipei,Wu-Nan Book Co.

Guo Jian Hong (2000) Effects of Screen Type, Polarity, and Target/Background Color Combination on Sensitivity and Subjective Preference, National Taiwan University of Science and Technology, Department of Industrial management.

IChen Chang (1998) Human Engineering,Taipei, Sheng-Chih Book Co.

Shuyao Lin (1983) The chromatology, Taipei, SanMin Books Co.