

CHAPTER 3

METHODOLOGY

This section describes the material, apparatus and procedure utilised in the experiment.

3.1 Materials

3.1.1 Neutral gray mask

3.1.2 PCCS color samples 5 hues, 4 tone and 3 achromatic colors,

dimension of color samples 3"x3"

5 hues : Red, Yellow, Green, Blue, Purple.

4 tone : Vivid(v), Dull(d), Light(lt), Dark(dk).

3 achromatic : White, Medium Gray, Black.

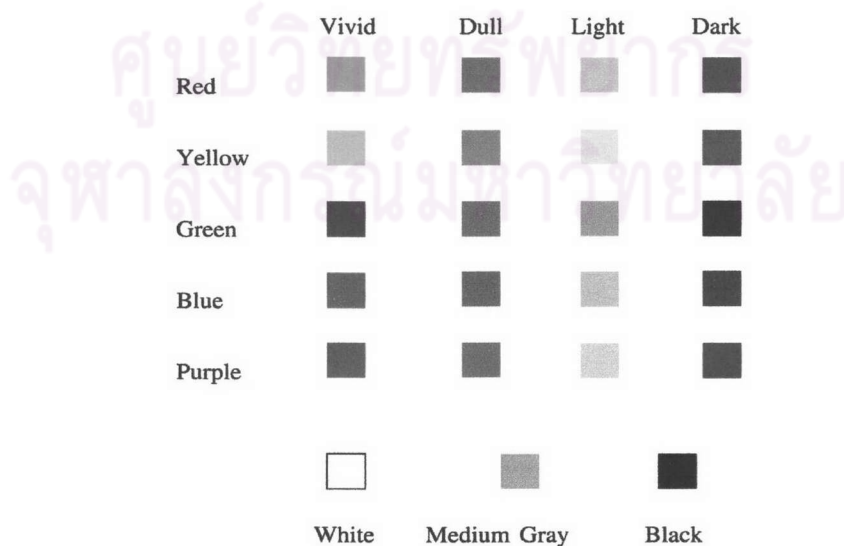


Figure3-1 PCCS 23 color samples.

3.2 Apparatus

3.2.1 Standard light cabinet with illuminant D65.

3.2.2 Spectrophotometer: Gretag Macbeth Color Eye 7000

3.3 Observers

3.3.1 Thai native speakers ranging in the age from 20-27.

3.3.2 The numbers of observers was 34(male17, female17)

3.4 Procedure

3.4.1 Measurement of color samples.

These color samples were measured by the Gretag Macbeth Color Eye 7000 under the illuminant D65 with 10 degree standard observer condition in terms of the colorimetric values as L^* , a^* , b^* , C^* and h .(see the data in Appendix A)

3.4.2 Arrangement two color combination pairs from color samples.

Twenty-three color chips were mutually combined. Therefore the total of two color combination pairs was 253 pairs.

3.4.3 Calculation color difference of color combination pairs.

Each two color combination's colorimetric values were calculated in term of color difference (ΔE), lightness difference (ΔL^*), chroma difference (ΔC^*) and hue difference (ΔH^*). (see the data in Appendix A).

3.4.4 Visual assessment experiment and analysis.

3.4.4.1 The fourteen opponent word pairs in Thai are “Dark-Light”, “Hard-Soft”, “Cool-Warm”, “Turbid-Transparent”, “Pale-Deep”, “Vague-Distinct”, “Light-Heavy”, “Sombre-Vivid”, “Weak-Strong”, “Passive-Dynamic”, “Plain-Gaudy”, “Subdued-Striking”, “Disharmony-Harmony” and “Dislike-like”.

3.4.4.2 Each of the opponent word pairs was divided into seven levels (+3 to -3), representing the magnitude of color sensation. The maximum value +3 was given to “Light”, “Soft”, “Warm”, “Transparent”, “Deep”, “Distinct”, “Heavy”, “Vivid”, “Strong”, “Dynamic”, “Gaudy”, “Striking”, “Harmony” and “Like”. Each step is 1 point so that opposite numerical response was -3 for “Dark”, “Hard”, “Cool”, “Turbid”, “Pale”, “Vague”, “Light”, “Sombre”, “Weak”, “Passive”, “Plain”, “Subdued”, “Disharmony” and “Dislike”, respectively. This process is called the seven-point method.

3.4.4.3 The Observers were asked to choose the magnitude of color sensation of the opponent word pairs when looking at the color samples under illuminant D65 in the light cabinet.

3.4.4.4 The visual scores were calculated from the answer of 34 observers as the percentage values ranging from +100% to -100% for each of the opponent word pairs. (see Appendix B) For example, the calculation of “Vivid-Sombre” percentage(VS%) is as following:

$$VS\% = \frac{a(-3) + b(-2) + c(-1) + d(0) + e(+1) + f(+2) + g(+3)}{3(a + b + c + d + e + f + g)} \times 100 \quad (3.1)$$

where; a, b, c, d, e, f and g are the number of observers who choose -3, -2, -1, 0, 1, 2 and 3 respectively.

If all observers select “very Vivid” (+3), VS% becomes equal to +100%. If all observers select “very Sombre” (-3), VS% becomes equal to -100%. If one half of the observers select “very Vivid” and the other half select “very Sombre”, the percentage will be zero.

Similarly, the opponent word pairs of “Dark-Light”, “Hard-Soft”, “Cool-Warm”, “Turbid-Transparent”, “Pale-Deep”, “Vague-Distinct”, “Light-Heavy”, “Weak-Strong”, “Passive-Dynamic”, “Plain-Gaudy”, “Subdued-Striking”, “Disharmony-Harmony” and “Dislike-like” can be calculated.

3.4.4.5 Plot graphs, representing the relationships between the visual scores of fourteen opponent word pairs and color difference (ΔE), lightness difference (ΔL^*), chroma difference (ΔC^*) and hue difference (ΔH^*) respectively.

3.4.5 Extraction Fourteen Opponent Word Pairs

3.4.5.1 Visual score of fourteen opponent word pairs were extracted by the factor analysis with the extraction method of the principal component analysis and an orthogonal rotation.

3.4.5.2 Three-dimensional color sensation scales were then set the coordinate of color combination.

3.4.6 Relationship of color sensations between single colors and two color combination.

3.4.6.1 Visual scores of each single colors (see Appendix C) were compared with those of two color combination to find the relationship between single color sensation and two color combination.

3.4.6.2 The visual results of color combination from observers were compared with those obtained from equation.

3.4.7 Relationship between “Disharmony–Harmony” sensation and CIE

L*C*h colorimetric values.

3.4.7.1 The visual scores of “Disharmony–Harmony” sensation were compared with chroma difference(ΔC^*) and hue difference(ΔH^*) to derive color harmony equation.

3.4.7.2 The visual results of “Disharmony–Harmony” sensation from observers were compared with those obtained from equation.

3.4.8 Relationship between visual score of “Disharmony–Harmony” sensation and “Dislike–Like” sensation

3.4.8.1 The visual scores of “Disharmony–Harmony” sensation were compared with those of “Dislike – Like” sensation to derive “Dislike-Like” equation by color harmony value from 3.4.7.1 to predicted “Dislike–Like” value.

3.4.8.2 the visual results of “Dislike–Like” from observers were compared with those values obtained from equation.

3.4.9 Comparison the visual assessment of fourteen opponent word pairs

The visual assessment of fourteen opponent word pairs were mutually compared to find the relationship between two opponent word pairs.