Keywords: Multimedia, University Classroom, PPT Courseware, Student, Teaching.

Abstract. To promote the positive effects of multimedia teaching methods in university, the students' age, grade and gender on the preference for color matching of "power point" (PPT) courseware was investigated. The results showed that students with younger age tend to prefer PPT courseware with colorful colors. The preference of junior and senior students for PPT background color was more consistent as follows: white was the favorite color, yellow was the second, and purple was the least favorite background color. As to the effect of student gender, white was also the most popular for PPT background color, purple was the least popular, but the second most popular color was cyan. When these colors were used as PPT backgrounds, the large color contrast of the font was the popular combination in students; the combination of background and font with poor contrast were discarded by all students.

Introduction

Nowadays, multimedia is an indispensable teaching tool in the course of universities. Teachers mainly impart knowledge to students by explaining or playing multimedia courseware. Among them, the "power point" (PPT) of Microsoft office software is the most commonly used multimedia courseware, which provides a variety of examples and templates for producers to choose. However, the monotonous color multimedia PPT courseware, which greatly reduced the effect of multimedia on students' visual stimulation, result in the transferred attention of students in a short period of time. Therefore, many students are manifested by playing mobile phones, being in a daze, sleeping, etc., which further leads to a decline in effects of classroom teaching[1]. It is well known that human beings will feel happiness when they see a favorite or lively color. This behavior will have a multiplier positive effect on learning and work[2-4]. Previous studies have shown that the background color will affect the memory processing process of mankind during the reading materials, and suitable color stimulation can help learners improve their learning effective[5-7]. PPT courseware is the mainly multimedia for students to form visual stimuli in the classroom. The appropriate background and content color in PPT courseware can promote students' learning passion. However, there are few studies in this area.

In the present study, students in the junior and senior classes from Fujian Agriculture and Forestry University were investigated to obtain the effect of student's age, gender, and grade on preferences of PPT courseware background and content color. The present results will guide design for color matching of multimedia PPT courseware.

Methods and Data Collection

There were total 63 students participated in the test. Among these, 38 and 25 undergraduate students in Fujian Agriculture and Forestry University were enrolled in 2013 and 2014, respectively. The sample text "font abc" in the Microsoft Office Word 2007 was used as the PPT content. The A4 size (210×297 mm) paper with the Arabic numeral number was printed as the answer sheet. The
According to the principle that the color in the computer is mixed by RGB (red, green, blue), which was corresponding to the different color machine code range from 0 to 255. After combination of machine code 0 or 255 of color red, green, and blue, there were 8 combinations in total. That were white (RGB=255, 255, 255), black (RGB=0, 0, 0), red (RGB=255, 0, 0), yellow (RGB=255, 255, 0), green (RGB=0, 255, 0), cyan (RGB=0, 255, 255), blue (RGB=0, 0, 255), and purple (RGB=255, 0, 255). The color of 8 combinations were used as the background of PPT courseware, and were scored by students with preference (e.g., like = 100, dislike = 0, other condition will obtain scores between 0 and 100). The color combinations with the highest, second, or lowest score were used as the PPT background, and the other seven colors as the content were combined in order of light wavelength from long to short, and then the students scored these color combinations. The data was processed and analyzed using Microsoft Office Excel 2007.

Results and Discussion

Effect of Students’ Age

The results of the survey on the preference of PPT background with white, black, red, yellow, green, cyan, blue, and purple colors for students aged range from 20 to 23 are shown in Figure 1a. The preference of students with the consistent age for PPT background and content color combination is shown in Figure 1b, Figure 1c, and Figure 1d, respectively.

![Figure 1. The Relationship Between Students’ Age and PPT Courseware Color (a: the relationship between different ages and background color; b: the preference of 21 years old students on white background and different content color; c: the preference of 21 years old students on cyan background and different content color; d: the preference of 21 years old students on purple background and different content color).](image)

It can be seen from Figure 1a that students with different ages prefer white as the PPT background color rather than purple. This may be related to feel of different colors. Generally, people will experience a broad and bright feeling with white, because white reduce people's sense of oppression as well[3, 4, 6]. More over, white is very common in nature or artificially buildings, and is also a favorite background color for people, such as most people like white snow, interior wall decoration...
Purple is a color between cool and warm tones, with low-lightness and easy to cause psychological negative effect. Yellow is a warm color, and cyan gives people a lively and bright feeling, hence many students chosen the yellow and cyan as the PPT background color. Besides, students who are slightly younger (such as 20 or 21 years old) scored higher on the brighter background color than older (such as 23 years old), indicating that younger students prefer to see colorful colors in PPT courseware.

The 21 years old students were used as the survey object due to the maximum number. On a white background (Fig. 1b), students had the highest selectivity for black content, up to 90 points, whereas the lowest selectivity was yellow content (43 points). This is ascribed to the large chromatic aberration between white and black, and the small chromatic aberration between white and yellow. A large number of studies have shown that the contrasting background and content of the color is easy to stimulate the visual, thus people can clearly know the content on the background[4]. However, the monotonous black and white color is readily cause visual fatigue, resulting in decreased attention and poor learning effective of students. White backgrounds combined with red and blue characters were also popular (scores were above 75 points, and red was higher than blue). This is indicated that color-containing content match a white background is acceptable for a PPT courseware. When cyan was used as the PPT background (Fig. 1c), the black content had the highest score (75 points), and the green content obtained the lowest score (36 points). This is because the high contrast can be observed between black and cyan. When purple was used as the PPT background (Fig. 1d), the highest white score was 65 points, and the lowest red score was 24 points. This is implied that purple background color is not the right color for students, and the evaluation of the background and other color matching results may not affect its preference for the overall color matching effect.

**Effect of Grade**

The results of the survey on the PPT background color of white, black, red, yellow, green, cyan, blue, and purple in the junior and senior students are shown in Figure 2a. The preferences of the junior students for the PPT background and content color combination are shown in Figure 2b, Figure 2c, and Figure 2d, respectively.

![Figure 2](image)

Figure 2. The Relationship between Students’ Grade and PPT Courseware Color (a: the relationship between different grade and background color; b: the preference of junior students on white background and different content color; c: the preference of junior students on cyan background and different content color; d: the preference of junior students on purple background and different content color).
As can be seen from Figure 2a, the white background was the most popular, and the purple background was the least favorite for students. Cyan background was accepted by most of students, but the preferences for the yellow background are different: Juniors had a preference for yellow background of 61 points, while seniors had 47 points, which may be ascribed to the younger age of juniors. When PPT background color was white, the score was the highest with black font, followed by blue and red, and the lowest score with yellow font. This suggests that young students were also interested in PPT courseware with obvious contrast color, but resistant the color with small chromatic aberration and high brightness such as the combination of white and yellow. When the yellow was used as the background color of PPT courseware, black and white font obtained the highest and lowest scores, respectively. When the purple color was used as the background color of PPT courseware, white and red were the font colors that students like and dislike. This indicated that under condition of the background color and the font color of PPT courseware were relatively monotonous, the contrast between the two color was the focus of the student's preference.

Effect of Gender

Effect of student gender on preference of the PPT background colors is shown in Figure 3a. The preference of male students for the combination of the PPT background and content color is shown in Figure 3b, Figure 3c and Figure 3d. Both male and female students love the white and hate the purple as PPT background color. When white was set to background color, the combination of white and black were the most popular, as followed the combination of white and blue, white and red, and white and yellow, which trend was similar to the effect of age on color matching. When cyan was used as the PPT courseware background color, the black font color was the most popular, but reversed in the green font color. On the purple background, the black and red font color were the highest and lowest score, respectively. This trend of score change may be related to the difference in foreground and background color contrast in PPT courseware.

Figure 3. The Relationship between Students’ Gender and PPT Courseware Color (a: the relationship between different gender and background color; b: the preference of male students on white background and different content color; c: the preference of male students on yellow background and different content color; d: the preference of male students on purple background and different content color).
Effect of Other Factors

During the study, it was also found that the concentration of students' attention was also affected by the environment and the quality of the projector. For example, classroom walls were not repaired for a long time and dusty with dark color, which could lead to students being listless. Poor quality or damaged the projector may be unclear the color on the screen. The high contrast background and font color (such as white background and black font) were easy to cause the edges and corners, and the students' eyes were easy to fatigue. This suggests that it is necessary to repair the damaged constructions and equipments as soon as possible.

Conclusions

White and purple were the most loved and hated PPT courseware background colors for students, and the younger students were tended to prefer colorful PPT courseware. PPT courseware had the highest score on white background color with black fonts, and the lowest score on purple background color with red fonts. The dark background with bright color fonts and the traditional white background with black fonts were popular on students, but the former was suitable for the projector with good performance, whereas the latter.

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References


