

# Visual Language Retention: Do Visual Attributes of Multimedia Utilized in the Classroom Have an Effect on Retention?

Susan Mary MEIKI

Graduate School of Integrated Arts and Sciences, Hiroshima University

## Introduction

Multimedia presentation of information in instruction is widely used in many academic and business settings around the world. The multimedia part of this instruction is not only the use of computers, but also includes textbooks with pictures, handouts, videos, etc., anything that uses “multiple” sources of media and multiple perceptions to learn. Today there is a need for a well-defined, wide-spread, and easy to remember definition of visual grammar for presentation software use in the classroom. This research presents the finding of three attributes of this visual grammar, background color, font style, and text density. A platform of presentation software was used to test and define these characteristics on student retention in a classroom setting. In addition, this research was conducted in Japan and the USA to ascertain if there is a cross cultural perceptual

difference in retention of information.

## Chapter 2: Background Color and Retention

The first part of research determined if non-image forming color has an influence on retention of material presented in a learning environment. A presentation was developed and presented to groups of university students in their university’s native language, 262 students from three Japanese universities and 111 students from three USA universities. All characteristics and timings of the presentations were kept constant. The only difference between each language presentation was background color. The colors, blue, dark blue, white, green, and yellow were used in the experiments. A simple quiz was administered after the presentation to determine how much information was retained.

Statistical analysis revealed that the Japanese

Background Color	Average Mean (%)	Standard Deviation
Dark Blue	56.34	18.09
White	53.37	19.97
Green	50.17	19.30
Yellow	44.67	17.84
Blue	39.38	17.86

**Background Color Japanese Data Retention Results**

results of the surveys were statistically significant,  $p < .05$ . The overall means of the Japanese data collected are as follows:

The significance of the Japanese data and statistically non-significant USA results is indicative of the mono-cultural vs. multi-cultural societies. This can be related to the emotional meaning of colors in each society (Lockley et al., 2006; Suk & Irtel, 2010; Yoto, Katsuura, Iwanaga, & Shimomura, 2007). Japanese share a common meaning based for certain colors, hence the statistically significant results and the USA students from varied cultural backgrounds and international experiences, revealed a non-statistical result. Past research has proven that emotion does have an influence on retention and certain colors stimulate particular emotions unique for each culture (Dresler, Mériaux, Heekeren, and Van Der Meer, 2009; Küller et al., 2008; Lockley et al., 2006).

### Chapter 3: Font Style and Retention

The second experiment determined if font style has an influence on retention presented in a learning environment. A presentation pertaining to a public directive was developed and presented to university students in their native language. The Japan group tested seven types of font styles and surveyed 204 students on the retention of the material presented. The USA group presented four types of font styles to 57 university students. Font styles were chosen based on popularity in the country surveyed with the addition of the national font style used in public highways. The addition of the use of the highway font style is to determine if visibility is the only factor in retaining information presented (Garvey, Pietrucha, & Meeker, 1997 ; 東日本高速道路株式会社 et al., 2011) .

The results revealed statistically significant findings for the USA scores.

	Mean	SD
Arial (Helvetica)	23.33	3.2
Comic Sans	20.69	4.1
Clearview (Road Geek)	18.39	4.1
Verdana	16.36	3.3

Analysis revealed that in the USA, emotions were closely related to font styles used. USA students had a high emotional relationship with the Comic Sans font which has a strong negative connotation (Mackiewicz, 2003; Brumberger 2003). Examples of this negativity can be found in current news articles today (Morris, 2012c). Arial is a most widely used font in public transportation in the New York metropolitan area where these surveys were conducted (Shaw, 2008). However the Arial data results had a lower than 10 student survey population and is not a reliable source.

The overall Japanese data for font styles revealed a no statistically significant data comparisons. Japanese fonts are more purposeful and standardized. For example, all textbooks in Japan use a “textbook” style font and the majority of newspapers in Japan use MS-Gothic.

In this part of the research, unconscious emotions generated from certain use of font styles can be determined to have a significant influence on retention of information. The same emotional influence as the background color.

### Chapter 4: Text Density and Retention

The final section of this research concerned the relationship of text density and the retention of information. Three types of text dense presentations were created and shown to 246 university students in Japan and 54 university students in the USA. Overall, there was no statistical significance determined between each country group. This supported the research review that the processing

of text / images and audio information is a function of processing in the brain and not a culturally influenced, emotional factor relating to the number of words presented on a slide (Han & Ma, 2014; Park and Gutchess, 2006; Hedden et al., 2002). Further analysis of each set revealed that the Japanese data was statistically significant  $p < .0001$ , but the USA data was not,  $p < .09$ . Further analysis of the Japanese data revealed significant difference between densities. However, what is causing this significance? Further analysis revealed, when grouping statistically significant answers with statistically non-significant answers, that the number of words / morphemes, slide timings, or placement of information on a slide, was not the determining factor for statistically significant correct answers. However, the number of propositions or ideas / concepts on the slide showed wide delta values when comparing average number of propositions on a slide between these two groups. The optimum number of propositions on a slide was determined to be about 12, using a phrase based wording on a slide.

The results revealed a statistical difference and preference in certain colors, and font styles particular to country specific groups. In addition, results indicated no cultural difference between groups for text density, but revealed a statistically significant result to define an optimum text density with regards to higher retention rates and the number of ideas on a slide. This research reveals a statistical influence on a student's retention of information presented based on the visual attributes of presentation software design and begins to define some culture-specific attributes of visual grammar to help retain information.

## References

- Brumberger, E. (2003). The rhetoric of typography: the awareness and impact of typeface appropriateness. *Technical Communication*, **50**(2), 224-231. Retrieved from <http://www.ingentaconnect.com/content/stc/tc/2003/00000050/00000002/art00008>
- Dresler, T., Mériaux, K., Heekeren, H. R., & Van Der Meer, E. (2009). Emotional Stroop task: Effect of word arousal and subject anxiety on emotional interference. *Psychological Research*, **73**(3), 364-371. doi:10.1007/s00426-008-0154-6
- Garvey, P., Pietrucha, M., & Meeker, D. (1997). Effects of Font and Capitalization on Legibility of Guide Signs. *Transportation Research Record*. doi:10.3141/1605-09
- Han, S., & Ma, Y. (2014). Cultural differences in human brain activity: A quantitative meta-analysis. *NeuroImage*, **99**, 293-300. doi:10.1016/j.neuroimage.2014.05.062
- Hedden, T., Park, D. C., Nisbett, R., Ji, L.-J., Jing, Q., & Jiao, S. (2002). Cultural variation in verbal versus spatial neuropsychological function across the life span. *Neuropsychology*, **16**(1), 65-73. doi:10.1037/0894-4105.16.1.65
- Küller, R., Mikellides, B., & Janssens, J. (2009). Color, arousal, and performance - A comparison of three experiments. *Color Research and Application*, **34**(2), 141-152. doi:10.1002/col.20476
- Lockley, S. W., Evans, E. E., Scheer, F. a J. L., Brainard, G. C., Czeisler, C. a, & Aeschbach, D. (2006). Short-wavelength sensitivity for the direct effects of light on alertness, vigilance, and the waking electroencephalogram in humans. *Sleep*, **29**(2), 161-168. doi:10.5665/sleep.2894
- Mackiewicz, J. (2003). What Technical Writing Students do Know and Should Know About Typography. In *Professional Communication Conference, 2003. IPCC 2003 Proceedings* (pp. 209-222).
- Morris, E. (2012c). Hear, All Ye People; O earth (Part 1). *New York Times*. New York, New York, USA. Retrieved from <http://opinionator.blogs.nytimes.com/2012/08/08/hear-all-ye-people-hearken-o-ear-th/>
- Park, D., & Gutchess, A. (2006). The cognitive neuroscience of aging and culture. *Current Directions in Psychological Science*, **15**(3), 105-108. doi:10.1111/j.0963-7214.2006.00416.x
- Shaw, P. (2008). The (Mostly) True Story of Helvetica and the New York City Subway. *AIGA*. Retrieved May 20,

2008, from

<http://www.aiga.org/content.cfm/the-mostly-true-story-of-helvetica-and-the-new-york-city-subway>

Suk, H. J., & Irtel, H. (2010). Emotional response to color across media. *Color Research and Application*, **35**(1), 64-77. doi:10.1002/col.20554

Yoto, A., Katsuura, T., Iwanaga, K., & Shimomura, Y. (2007). Effects of object color stimuli on human brain activities in perception and attention referred to EEG alpha band response. *Journal of Physiological Anthropology*, **26**(3), 373-379. doi:10.2114/jpa2.26.373

東日本高速道路株式会社, 日本高速道路株式会社, & 西高速道路株式会社. (2011). Information About Changing the Label Layout with the Aim of Making Highway Information Signs More Visibleより視認し易い高速道路案内標識を目指した標識レイアウトの変更について (pp. 1-18).