Metacognitive and Aesthetic Design of Presentation Slides

Steve Semken

Presentation graphics software is widely used in geoscience teaching, but used straight out of the box, or casually, it can be pedagogically stifling. This session offers a few ideas and suggestions for enhancing your slide presentations. It draws on cognition and visualization research, information design, aesthetics, and the presenter’s own empirical observations. You are invited to follow as many, or as few, of these recommendations as you choose to do—but give them some thought.

semken.asu.edu/teaching/cp10slides.pdf

July 2010
How much do you use presentation software? For what purposes? Do you find it useful? A necessary evil? An opportunity to be creative? …Have you been subjected to some really awful presentations?

We will explore the design (good and bad!) and use of digital slides from the perspectives of:

(1) Accessibility (legibility) of slides for diverse audiences
(2) The cognitive style of digital presentation software
(3) Aesthetic considerations
The Principles of Universal Design characterize maximum accessibility and usability of technologies and environments.

Principle Four (of seven): Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities.

Guidelines:

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Provide adequate contrast between essential information and its surroundings.
- Maximize “legibility” of essential information.
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

Intrusive backgrounds cause contrast problems.

Don’t you think it’s difficult to focus on, read, and analyze the content of a slide with a cute, irrelevant, and intrusive background?

This is particularly true if the presenter is trying to show graphical data.

Beware of backgrounds imposed by presentation templates; plain is better.

Figure 3. Piper diagram (Piper, 1944) showing regional mixing trends. Fields modified from Crossey et al., 2006. Bars indicate well-defined regional and subregional mixing trends. Larger sections correspond to samples with higher total dissolved solids (TDS) values. TDS increases within each trend toward end-member compositions. Important end-member compositions and high-volume springs of the Colorado Plateau region are labeled: BS—Blair Spring, HM—Horsetooth, WD—Ward, FD—Frolick, A—Aurora, TM—Tulley, NE—Nebo, CL—Clear Lake, VA—Vallecito, L—Lamotte, RS—Rixey Spring, TR—Thunder River Spring, TS—Traveler’s Spring.
Sometimes it may be necessary to include a large, bold graphic that takes up most or all of the background under text.

Use contrasting text colors to enhance legibility.

**Shadowing text can be effective.**

Drop shadow is even better. **Embossed text is another option.**

If it is acceptable to obscure part of the image, fill the text box with a color that contrasts with the text (perhaps one picked from the image).

Or, you can make the text box translucent by increasing its transparency to suit (this is 40% transparent).
The choice of typeface, font, and font size affects legibility.

Sans-serif (vs. serif) fonts are preferred when legibility at a distance is a concern.

<table>
<thead>
<tr>
<th>Sans-serif (vs. serif) fonts</th>
<th>Arial 24</th>
<th>Arial 20</th>
<th>Arial 18</th>
<th>Arial 16</th>
<th>Arial 14</th>
<th>Arial 12</th>
<th>Arial 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arial</td>
<td>Arial 24</td>
<td>Arial Bold 20</td>
<td>Arial Bold 18</td>
<td>Arial Bold 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arial Italic</td>
<td>Arial Italic 24</td>
<td>Arial Italic 20</td>
<td>Arial Italic 18</td>
<td>Arial Italic 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helvetica</td>
<td>Helvetica 24</td>
<td>Helvetica 20</td>
<td>Helvetica 18</td>
<td>Helvetica 16</td>
<td>Helvetica 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helvetica Bold</td>
<td>Helvetica Bold 24</td>
<td>Helvetica Bold 20</td>
<td>Helvetica Bold 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helvetica Italic</td>
<td>Helvetica Italic 24</td>
<td>Helvetica Italic 20</td>
<td>Helvetica Italic 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verdana</td>
<td>Verdana 24</td>
<td>Verdana 20</td>
<td>Verdana 18</td>
<td>Verdana 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verdana Bold</td>
<td>Verdana Bold 24</td>
<td>Verdana Bold 20</td>
<td>Verdana Bold 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verdana Italic</td>
<td>Verdana Italic 24</td>
<td>Verdana Italic 20</td>
<td>Verdana Italic 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candara</td>
<td>Candara 24</td>
<td>Candara 20</td>
<td>Candara 18</td>
<td>Candara 16</td>
<td>Candara 14</td>
<td>Candara 12</td>
<td></td>
</tr>
<tr>
<td>Candara Bold</td>
<td>Candara Bold 24</td>
<td>Candara Bold 20</td>
<td>Candara Bold 18</td>
<td>Candara Bold 16</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A viewer with any of the three known types of color blindness may view your slides quite differently from those who do not have such color vision deficiency (Bajaj, 2009):

**Original**

**Deuteranope**
(One form of red-green color deficit)

**Protanope**
(Another form of red-green color deficit)

**Tritanope**
(Blue-yellow color deficit, much less common)

Red text on a green background is especially problematic (Bajaj, 2009):

You can download the Vischeck plug-in for Adobe Photoshop, to check your image files for legibility by color-blind individuals: http://www.vischeck.com
Beware of potential **distractors** in projected images!

Recent eye-tracking studies indicate that when an image contains a person or animal as “scale,” students are drawn to focus on the distractor, and survey the scene less.

Instead, use a consistent and boring scale in photos and include people only if it is necessary to show how we study a problem.

Thoughts or questions about legibility?
The cognitive style of PowerPoint (Tufte, 2003; 2006)

Renowned information-design expert Edward Tufte has issued a damning indictment of PowerPoint. These are his principal arguments:

1. PowerPoint slides have extremely narrow bandwidth compared to other forms of information transfer (e.g., reports, newspapers).

2. Hierarchical bullet lists truncate explanations and dilute thought. “Power points” replace complete sentences as the basic explanatory units in presentations.

3. The sequential slide format arbitrarily partitions the flow of information:

   Data are stacked in time rather than presented synoptically, obscuring context and making comparative reasoning difficult.

   Insertion of “PP Phluff” such as clip art and animations merely combats numbing repetition with meaningless entertainment.
3. Build sequences control the order and pace of reading and learning; they are presenter-centered, not student-centered.

4. Out-of-the-box PP templates and stylesheets propagate the cognitive style.

5. Lazy use of printed PP slides as handouts, in place of written reports, infects the paper-based presentation method.


Tufte’s *The Cognitive Style of PowerPoint* presented in the form of a PowerPoint presentation (Swartz, 2003)...

- **Overview**
  - PowerPoint is standard…
  - ...but bad.
  - Why?
- **Cognitive Style**
  - Is presenter-oriented
  - Audience and content suffer
    - Low resolution
    - Deeply hierarchical
    - Preoccupied with form
- **Low Resolution**
  - Nearly content-free
  - Only slightly better than 1982 *Pravda* propaganda!
Tufte’s *The Cognitive Style of PowerPoint* presented in the form of a PowerPoint presentation (Swartz, 2003) …

- Dilutes Thought
  - Bullets make us stupid
    - Too generic
    - Omit relationships
    - Omit assumptions
    - Omit subjects, verbs
- Deeply Hierarchical
  - Often 6 levels deep
  - Feynman [*Lectures on Physics*] only needed 2
- Why?
  - Based on software corporation itself
    - Big bureaucracy
    - Programming computers
      - Deeply hierarchical
Tufte’s *The Cognitive Style of PowerPoint* presented in the form of a PowerPoint presentation (Swartz, 2003) ...

- **Why? (continued)**
  - Marketing
    - Misdirecting
    - Sloganeering
    - Exaggerating
  - **What could be worse?**
    - Stalin?
  - **Pushy**
    - Bullets are to be followed
  - **What Else?**
    - **Better: good teaching!**
      - Explanation, reasoning, etc.
      - Credible authority
Tufte’s *The Cognitive Style of PowerPoint* presented in the form of a PowerPoint presentation (Swartz, 2003) ...

- **PowerPoint in Schools**
  - Disturbing!
  - Must find replacement
    - Good alternative: teaching kids to smoke
    - Better: close school, go to Exploratorium
    - Best: write illustrated essay

- **Stylesheets**
  - Corporate logowear
    - Gives name of corporate dept
  - Emulate reading primers for 6-year olds
  - Poor typography is key
  - Break things up to prevent comparison
  - Useless tables
Tufte’s The Cognitive Style of PowerPoint presented in the form of a PowerPoint presentation (Swartz, 2003)

- World Domination
  - Printed PowerPoints: 50 slides = 1 page of Physician’s Desk Reference
  - Online PowerPoints: 20% of information density of popular websites
  - Worst signal-to-noise ratio known!
  - It’s like out-of-control prescription drug

Improving Presentations
- Get better content
- Provide handouts
- Handouts let audience control order and pace

How can we learn from Tufte—without throwing the baby out with the bathwater?

Don’t use out-of-the-box templates and stylesheets. Create your own!

Maximize the signal-to-noise (or data-to-ink) ratio: integrate text and graphics; take up plenty of space on the slide.

Avoid or minimize the use of “Phluff,” including build sequences, cute slide transitions, and distracting animations or sounds.

(...Builds may be appropriate if a slide is used for an interactive exercise, in which you do not want to reveal all the information at once.)

Don’t “brand” your slides excessively: slide number and a simple identifying phrase or symbol are all you need.

Present text in complete, thoughtful sentences, not bullet points.
The concept sketch is a good model for effective integration of graphics and text on a slide.

Note the synoptic organization of graphics and text, use of sentences as labels, and inclusion of all relevant data on a single slide. This figure is in black-and-white but a similar figure in color would also work well.

Thoughts or questions about cognitive style?
Here are a few thoughts on aesthetics and style, with examples.

Give some thought to the typefaces, colors, and patterns you use (or could use) in your slide presentations.  

*Are they appealing, or at least, not boring?*  
*Do they evoke or reinforce your subject matter?*  
*Do they help you define a learning environment?*

If you use ready-made image or text slides (e.g., provided by a textbook publisher), do you tweak them in any way?

A bit of thought and effort expended on the aesthetics of your design and presentation (short of transgressing Tufte’s dicta about ‘Phluff’ and branding) demonstrate your enthusiasm for the topic and for your teaching or research.
Four major processes shape and sculpt Southwestern landscapes.

Ascent and eruption of molten rock: Volcanism

Reshaping the crust by folding and fracturing: Tectonics

Sculpting the surface by erosion and deposition: Gradation

Cratering by impacts from space

(Internal processes)  (External processes)
Migrating seas deposit a sequence of sediments. Observe what happens when seas regress from land. Sandstone, mudstone, and limestone are deposited as the sea recedes. Beach sand forms over mud during a regression. Reynolds et al. (2008)
What’s the depositional history here?

Cretaceous marginal and marine sedimentary rocks, East of Beclabito, Navajo Nation, New Mexico

It took millions of years for ocean slime and sun to fight it out but finally sunshine won. Now that sea is a mountain of rock that I climb with a shell in my hand.

Byrd Baylor
Darwin returned to England, and for years pursued anatomical and other biological studies.

Broadly based evidence convinced Darwin that organic evolution produced the vast number of species.