Principles of Effective Science Communication

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South Carolina Science Communication Course
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Develop a consistent style and format

- **Within** products, and also **between** products
  - Newsletters, presentations, websites, books
- Train your audience
- Use *Master Slide* or *Master Page* functions to ensure consistency
Typography is the art of words

- Spelling and grammar
- There are two types of fonts – serif, and sans serif

**Serif**
- Serifs are these small strokes at the ends of characters

**Sans serif**
- Sans serif fonts lack these strokes

This is a serif font. Which of these fonts is easier to read?

<table>
<thead>
<tr>
<th>Serif fonts</th>
<th>Sans serif fonts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times New Roman</td>
<td>Arial</td>
</tr>
<tr>
<td>Garamond</td>
<td>Century Gothic</td>
</tr>
<tr>
<td>Palatino</td>
<td>Helvetica</td>
</tr>
</tbody>
</table>

This is a sans serif font. Which of these fonts is easier to read?

- Sans serif fonts are more readable from a distance
Typography is the art of words

- Text justification depends on layout, how much text you have, and medium (presentation, book, etc)

**Fully justified text** is lined up on both the left and right margins, but with different spacing between words. You can fit more text in fully justified paragraphs, however it can make the document look more crowded.

**Flush left-ragged right justification** has uneven spacing on the ends of the lines on the right margin, but keeps the spacing between the words the same. Flush left-ragged right justification does not look as tidy as fully justified text, but it adds white space at the ends of each line, which can make the overall document look less crowded.

There are no hard and fast rules about which kind of justification to use. It depends on the overall layout of your document, your audience, how crowded or sparse the text is, and the fonts and margins of the document. Try experimenting with different kinds of justification and use what most effectively communicates your message.

For small amounts of text or short, narrow lines, use flush left-ragged right justification, otherwise, the different spacing between words becomes very noticeable and impedes easy reading by creating rivers of white space running down the lines. These rivers of white space can be minimized by using your software’s preferences to set the maximum and minimum spacing between words.

Having narrow columns of fully justified text creates unsightly rivers of white space.
Use color, but use it judiciously

- Use color judiciously, especially red and green
- Contrast between your background, and text/graphics is important
- Improper use of color can alienate your audience

Brown

Dark blue

Dark green

Black
RGB vs. CMYK

- **Red, Green, Blue**
- Transmitted light (presentations, websites)
- Mixing the colors results in white light
- Absence of color results in black

- **Cyan, Magenta, Yellow, black**
- Printed ink (posters, newsletters)
- Mixing the colors results in black ink
- Absence of color results in white (or the background color)
Use the right resolution

• Resolution differs between different media
  • Printed products need 300 DPI
  • Presentations and websites need 96 DPI
• Using the right resolution for your communication will ensure your graphics are clear, and will also help with managing file size
Image types and formats

• **Raster/bitmap graphics** (photos, scans; resolution-dependent)
  - TIFF  CMYK or RGB; large file size due to lossless compression
  - JPEG  CMYK or RGB; small file size due to lossy compression
  - GIF   RGB; small file size due to less colors; use on websites; transparency
  - PNG   RGB; relatively new format; transparency
  - EPS   CMYK or RGB; usually just for spot color images

• **Vector graphics** (created using software; resolution-independent)
  - EPS   CMYK or RGB; maintains resolution independence

**Integration, Application, Network**
## Image types and formats

<table>
<thead>
<tr>
<th>Destination</th>
<th>Resolution</th>
<th>Color format</th>
<th>Image format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>300 DPI</td>
<td>CMYK</td>
<td>EPS, TIFF, JPG</td>
</tr>
<tr>
<td>Screen</td>
<td>96 DPI</td>
<td>RGB</td>
<td>PNG, GIF, JPG</td>
</tr>
</tbody>
</table>

- It is worth the time and effort to create graphics for both printing and presentations
  - Optimize file size
  - Once you have the different formats, you can use them over and over again
Graph formatting makes all the difference

Bad (or no) formatting

- Boxes, gridlines and white background are distracting – “chart junk”
- Axes not labelled, y-axis obscuring data
- Boring black and white

Good formatting

- Transparent background, no boxes or gridlines
- Large labelled axes with units at end
- Contrasting colors
Graph formatting makes all the difference

Bad (or no) formatting

- Boxes, gridlines and white background distracting
- Axes label too technical, too many tick marks on y axis
- Excel default colors

Good formatting

- Transparent background, no boxes or gridlines
- Large, clearly-labeled axes, with units at end
- Contrasting colors
Get them right in data software first

- Use colored background box to facilitate color matching
- Remove graph background
- Remove grid lines, borders & unnecessary legends (i.e. if only one data series)
- Clean up extra tick marks and increase intervals between marks
- Label axis with title and units
- Select text and right click to format (subscript, etc)
- Delete colored background
<table>
<thead>
<tr>
<th>Region</th>
<th>EHI</th>
<th>Region area (km²)</th>
<th>% area region</th>
<th>DO</th>
<th>Secchi</th>
<th>Chl a</th>
<th>TP</th>
<th>TN</th>
<th>δ¹⁵N</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.21</td>
<td>21</td>
<td>13</td>
<td>0.66</td>
<td>0.00</td>
<td>0.34</td>
<td>0.00</td>
<td>0.09</td>
<td>0.15</td>
</tr>
<tr>
<td>Middle Patuxent</td>
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<td>37</td>
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- No vertical lines, minimize horizontal lines, use color and fonts to emphasize data
Format maps to include more information
A map sequence can show temporal changes

- Improvements or degradation over time can be highlighted by a series of maps
- Consistent layout allows comparisons
- Maps should have scale and compass direction
- Maps should have a legend that is self contained & legible
Hurricane Isabel surge height
Cropping and annotation of photos can be very informative.

Photos that are well chosen, cropped, aligned, distributed evenly and annotated provide information on methods, study site, description & relevance.
Crop, align, and label photos carefully

Photos that are well chosen, cropped, aligned, distributed evenly and annotated provide information on methods, study site, description & relevance.

Pay attention to alignment & overlapping.

Lesson: bad science communication = skin lesions.
Combining all visual elements

Site selection

Community composition & morphology

Site

Grazed

Nitrogen fixation
Natural grazing trails

Nitrogen fixation per m²

Nitrogen fixation per plant biomass

Simulated grazing trails

Grazer exclusion

Nitrogen fixation per m²

Nitrogen fixation per plant biomass

Nitrogen fixation per m²

Nitrogen fixation per plant biomass

• Set up color pattern early on and train the audience
Principles of science communication

1. Provide synthesis, visualization & context
2. Relate to audience – provide big picture to local relevance
3. Simplify terms but not content (don't *dumb it down*, do *raise the bar*)
4. Use a key for unfamiliar visual elements.
5. Consistent *style* and *format* for continuity
6. Lose the jargon, dude
7. Define all unfamiliar terms,
8. Minimize AU (Acronym Use)
9. Engage audience: prepare for and invite questions
10. Use *color*, but use it judiciously