### Session Overview & Outcomes

#### Session Flow

- Accuracy of perception
- Chart types and uses
- Pre-attentive processing
- Refining chart elements to tell your story
- Group practice

#### Session Outcomes

- Participants will be able to:
  - Make decisions between various visual displays of information to best convey desired points.
  - Understand the relationship of visual perception to successful visual displays.
  - Select design elements best suited to aid the reader in understanding the information presented.
Important Note:

Data included in this presentation is not all real data—do not cite.
Effective Design Tells a Story

• Indicates how values relate to one another
• Accurately portrays quantities
• Makes comparison easy
• Organizes the information
• Makes it obvious how you should use the info

Anticipate the kind of questions the audience will have about the information and design accordingly.
Why not Pies and Donuts?
Cleveland and McGill’s Rank

1. **Position** along a common scale; e.g. scatter plot
2. **Length**; e.g. bar chart
3. **Angle & Slope** (tie); e.g. pie chart
4. **Area**; e.g. bubbles
5. **Volume, density, and color saturation** (tie); e.g. heatmap
6. **Color hue**; e.g. newsmap
What’s the Difference?

Sex

- Male
- Female

SEX

- Male
- Female
Make Comparison Easier

![Pie chart and bar chart showing comparison of values A, B, C, D, E, and F.]

- Value A
- Value B
- Value C
- Value D
- Value E
- Value F

Legend:
- Blue: Value A
- Orange: Value B
- Gray: Value C
- Yellow: Value D
- Green: Value E
- Red: Value F

Graph representation:
- Value A: 8
- Value B: 3
- Value C: 1
- Value D: 1
- Value E: 1
- Value F: 1
Picking the “right” chart

Comparison
Single values
Pattern of values
Change over time
Ranking
Distribution
Part-to-Whole
Undergraduate Research Participation
Fewer participate than anticipate engagement at college entry

Actual

Anticipated
Students anticipating participation in faculty research at entry to college: 78%

Students who actually participate in faculty research prior to graduating: 26%
Example: Time Series

Number of College Applications Submitted for Admission This Year (Not Including UCLA Application)

% of Students Reporting "6 or More"†

†Data points after 1996 represent the aggregate of three distinct options: "Six"; "Seven to Ten"; "Eleven or More."

*Survey administration moved to biennial cycle in 2009

Data Source: CIRP Freshman Survey—University of California Los Angeles
I feel free to express my religious beliefs on campus
% Responded "Somewhat Agree", "Agree", or "Strongly Agree"
Story: A Different Pattern of Change
Top 5 Reasons For Choosing UCLA

- UCLA has a very good academic reputation
- To be able to get a better job
- To learn more about the things that interest me
- To gain a general education and appreciation of ideas
- To prepare myself for graduate or professional school

% reporting “very important”
Students are respected regardless of their economic or social class.
Example: Part to Whole

Students are respected regardless of their economic or social class.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree
Reduce Non-data Ink
Where can you reduce ink?

### Sense of Belonging Factor Mean Scores (n=5,858)

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native American</td>
<td>48.3</td>
</tr>
<tr>
<td>Asian*** (n=2,277)</td>
<td>50.4</td>
</tr>
<tr>
<td>Black **(n=82)</td>
<td>47.8</td>
</tr>
<tr>
<td>Hispanic (n=737)</td>
<td>50.9</td>
</tr>
<tr>
<td>White*** (n=1,530)</td>
<td>52.3</td>
</tr>
<tr>
<td>Multiracial (n=308)</td>
<td>51.9</td>
</tr>
</tbody>
</table>

Note: Significance levels: ***p<.001; **p<.01;
Pre-Attentive Processing

Unconscious and high-speed processing that detects specific visual attributes.
Preattentive attributes of visual perception

Form

- Length
- Width
- Orientation
- Size
- Shape
- Curvature
- Enclosure
- Blur

Color

- Hue
- Intensity

Position

- 2-D position
- Spatial Grouping

Motion

- Direction of Motion
## Gestalt Principles

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity</td>
<td>Objects that are close together are perceived as a group.</td>
</tr>
<tr>
<td>Similarity</td>
<td>Objects that share similar attributes (e.g., color, shape) are perceived as a group.</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Objects that appear to have a boundary around them (e.g., border or area of common color) are perceived as a group.</td>
</tr>
<tr>
<td>Closure</td>
<td>Open structures are perceived as closed, complete and regular whenever they can be interpreted as such.</td>
</tr>
<tr>
<td>Continuity</td>
<td>Objects that are aligned together or appear to be the continuation of one another are perceived as a group.</td>
</tr>
<tr>
<td>Connection</td>
<td>Objects that are connected (e.g., by a line) are perceived as a group.</td>
</tr>
</tbody>
</table>
Using Color to Draw Attention

Percent reporting "none"
UCLA compared to other UCs

- Content about gender
- ...about race/ethnicity
- ...about socioeconomic class
- ...about privilege
- ...about sexual orientation
- ...about disability
- Service
- Intensive dialogue
Example: Too much color

Students are respected regardless of their economic or social class

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree
Where is attention directed?

<table>
<thead>
<tr>
<th>Value</th>
<th>Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value A</td>
<td>8</td>
</tr>
<tr>
<td>Value B</td>
<td>3</td>
</tr>
<tr>
<td>Value C</td>
<td>1</td>
</tr>
<tr>
<td>Value D</td>
<td>1</td>
</tr>
<tr>
<td>Value E</td>
<td>2</td>
</tr>
<tr>
<td>Value F</td>
<td>2</td>
</tr>
</tbody>
</table>
Use Style to Reinforce Story

Bigger, Brighter, Bolder, More Distinct = Important

Color contrast (draw attention)

Color similarity (invite comparison)

Larger text and bold colors draw attention

Grouping to aid comparison

Things that are similar (e.g. length, color, shape, size, etc.) are perceived as a group.

Things enclosed together or connected by lines are perceived as a group.
Key Summary Points

Focus on FUNCTION before FORM/STYLE

Use visuals to communicate your findings, not simply to entertain

Select a chart type that is appropriate to your data and message

Minimize use of “non-data ink”

Use aspects of perception to help tell your story

Don’t use excessive color variation

Don’t unintentionally highlight aspects that aren’t important
Case Studies

How would you do it?

Review case

Discuss what story you might want to communicate

Decide on a visual

Draw your visual on the flip-chart paper
More Things to Explore

Steven Few’s Website: www.perceptualedge.com

Nathan Yau’s Website: flowingdata.com

Stephanie Evergreen’s Website: stephanieevergreen.com

Cole Nussbaumer’s Website: www.storytellingwithdata.com

Cole’s YouTube Video on Using Color in Presentation
https://youtu.be/AiD6etOB6ql
References


Questions?

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