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Using Data to Tell Your Story

Kristen McKinney
University of California, Los Angeles, kmckinney@saonet.ucla.edu

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Using Data to Tell Your Story

Kristen McKinney, PhD
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WMU Assessment Conference
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 user in understanding the information presented.
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.
Steps in the Design Process

Identify Your Story

Prepare the Data

Select the Best Method to Display your Message

Create the Basic Visual

Refine the Design
Identifying Your Story

- Audience
- Project Q’s
- 3-4 Claims & Evidence
Refining your Design
Simplify:
Eliminate distraction by reducing non-data ink
Simplify

Remove gridlines and decimals
Use light colors and fine lines for any necessary non-data ink
Remove legend and label directly
Limit text and consider substituting symbols
Background color should be white or a light solid color
Let’s Reduce the Ink

Which of the following best describes your social class when you were growing up?

- Low-income or poor: 56.4%
- Working-class: 72.1%
- Middle-class: 89.6%
- Upper-middle or professional-middle: 85.2%
- Wealthy: 81.5%
- Total: 86.2%

% somewhat agree, agree, and strongly agree
Emphasize:
Highlight key points by capitalizing on pre-attentive processing
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
**Emphasize**

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.
Perception of Respect for Socio-Economic Status Varies By Social Class

% somewhat agree, agree, and strongly agree "Students of my socioeconomic status are respected on campus"

Low income or poor: 56%
Working-class: 72%
Middle-class: 90%
Upper-middle or professional-middle: 93%
Wealthy: 85%

All Students (81.5%)
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>
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

0%
100%
50%
Select Visuals to Match Key Points

- Comparison
- Change over time
- Ranking
- Distribution
- Part-to-Whole
# Data Tables

## Appropriate Uses

- Make overall comparisons of data
- Display exact figures
- Provide large amounts of info in a small space
- Use when you need to be able to look up exact values

## Tips

- Trends are better shown in graphs
- Use shading and borders to draw the eye
- Cluster similar data
- Bold important cell values
- Use when most values are small relative to overall
## Conservative students less likely to feel respect for their political views

% somewhat agree, agree and strongly agree

<table>
<thead>
<tr>
<th></th>
<th>Liberal</th>
<th>Middle of the Road</th>
<th>Conservative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel free to express my political beliefs on campus</td>
<td>89%</td>
<td>82%</td>
<td>68%</td>
<td>84%</td>
</tr>
<tr>
<td>Students of my political beliefs are respected on this campus</td>
<td>93%</td>
<td>89%</td>
<td>69%</td>
<td>88%</td>
</tr>
<tr>
<td>This institution values students' opinions</td>
<td>73%</td>
<td>77%</td>
<td>71%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Source: UCUES 2014

## Conservative students more likely to report hearing stereotypical remarks

% reporting somewhat often, often and very often hearing stereotypical remarks based on political orientation

<table>
<thead>
<tr>
<th></th>
<th>Liberal (n=2836)</th>
<th>Middle of the Road (n=1492)</th>
<th>Conservative (n=900)</th>
<th>Total (N=5228)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Faculty</td>
<td>7%</td>
<td>10%</td>
<td>14%</td>
<td>9%</td>
</tr>
<tr>
<td>From Staff</td>
<td>7%</td>
<td>9%</td>
<td>12%</td>
<td>8%</td>
</tr>
<tr>
<td>From Students</td>
<td>27%</td>
<td>27%</td>
<td>40%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Source: UCUES 2014
## Story: Showing Multiple Values (Means and Change)

<table>
<thead>
<tr>
<th></th>
<th>Pre-Test Mean</th>
<th>Post-Test Mean</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>My coping skills work well for me</td>
<td>2.86</td>
<td>3.17</td>
<td>0.31</td>
</tr>
<tr>
<td>When I feel stressed I have healthy strategies for relieving the feeling</td>
<td>2.63</td>
<td>3.13</td>
<td>0.50</td>
</tr>
<tr>
<td>I feel confident communicating with others</td>
<td>3.13</td>
<td>3.39</td>
<td>0.26</td>
</tr>
<tr>
<td>I feel confident in communicating with people who are different from me</td>
<td>3.04</td>
<td>3.37</td>
<td>0.33</td>
</tr>
<tr>
<td>I feel comfortable communicating about sex</td>
<td>2.91</td>
<td>3.14</td>
<td>0.23</td>
</tr>
<tr>
<td>I am able to communicate my needs in a romantic relationship</td>
<td>2.74</td>
<td>3.04</td>
<td>0.30</td>
</tr>
<tr>
<td>When I am upset I generally can articulate what is bothering me</td>
<td>2.76</td>
<td>3.04</td>
<td>0.28</td>
</tr>
</tbody>
</table>

* 4-pt Scale 1=Disagree Strongly to 4=Agree Strongly; All changes significant at p<.01

Source: Life Skills Course Assessment 2006-07
Another Option:

<table>
<thead>
<tr>
<th></th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>My coping skills work well for me</td>
<td>![Up Arrow]</td>
</tr>
<tr>
<td>When I feel stressed I have healthy strategies for relieving the feeling</td>
<td>![Up Arrow]</td>
</tr>
<tr>
<td>I feel confident communicating with others</td>
<td>![Up Arrow]</td>
</tr>
<tr>
<td>I feel confident in communicating with people who are different from me</td>
<td>![Up Arrow]</td>
</tr>
<tr>
<td>I feel comfortable communicating about sex</td>
<td>![Down Arrow]</td>
</tr>
<tr>
<td>I am able to communicate my needs in a romantic relationship</td>
<td>![Down Arrow]</td>
</tr>
<tr>
<td>When I am upset I generally can articulate what is bothering me</td>
<td>![Up Arrow]</td>
</tr>
</tbody>
</table>
Bar Charts

### Appropriate Uses
- Go-to option for comparing data
- Identify differences and patterns
- Time series (vertical only)

### Tips
- Horizontal for long labels
- Select axis scales that fairly represent without distortion
- Strategically order categories
Undergraduate Research Participation
Fewer participate than anticipate engagement at college entry
Students anticipating participation in research at matriculation: 78%

Students who actually participate in research prior to graduating: 26%
I feel free to express my religious beliefs on campus
% Responded "Somewhat Agree", "Agree", or "Strongly Agree"

![Bar chart showing longitudinal comparison for UC and UCLA. The y-axis represents the percentage of respondents, ranging from 0 to 100. The x-axis represents years from 2004 to 2012. The chart shows the percentage of respondents who agree with the statement for each year, with UC and UCLA represented by different colors. The percentages for each year are as follows: 2004 - UC: 86.1%, UCLA: 90.1%; 2006 - UC: 88.0%, UCLA: 85.8%; 2008 - UC: 88.0%, UCLA: 85.8%; 2010 - UC: 88.0%, UCLA: 85.8%; 2012 - UC: 88.0%, UCLA: 85.8%.]
Story: A Different Pattern of Change
Top 5 Reasons For Choosing UCLA

- UCLA has a very good academic reputation: 86%
- To be able to get a better job: 85%
- To learn more about the things that interest me: 85%
- To gain a general education and appreciation of ideas: 77%
- To prepare myself for graduate or professional school: 70%

% reporting “very important”
Story: Ranking

Case where you don’t use numbers at all…
# Stacked Bar

## Appropriate Uses

- To show general contribution of parts to whole
- To show cumulative aggregation of all values
- Can be used to show comparison of overall differences in two or more distributions

## Tips

- May not be appropriate when comparison of specific values within the stack is needed
- Align color scheme to story, e.g., similar colors for all + values
- Avoid excessive color variation
Students are respected regardless of their economic or social class
Story: Part to Whole

Students are respected regardless of their economic or social class

84% strongly agree.
Story: Comparing Patterns

Perception of Respect Varies by Social Class
"Students of my socioeconomic status are respected on campus"

Low-income or poor

Upper-middle or professional-middle
Why not Pies and Donuts?
How much this graph reminds me of Mr. T
Pie and Donut Charts

Appropriate Uses

- Display limited number of proportions
- Show the relationship of parts to a whole

Tips

- Not too many slices!
- Legends and lines that help highlight slices; or directly label if possible
- Show percentages for each slice
Student Use of Parking Lots

Source: University of Arizona
More Effective For Comparison

### Parking Lot Usage by Students

<table>
<thead>
<tr>
<th>Parking Lot</th>
<th>Usage Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyland Parking Lot</td>
<td>23.45%</td>
</tr>
<tr>
<td>Second Street Garage</td>
<td>18.88%</td>
</tr>
<tr>
<td>South of Six Lot B</td>
<td>16.78%</td>
</tr>
<tr>
<td>Lot 231</td>
<td>12.68%</td>
</tr>
<tr>
<td>6th Street Garage</td>
<td>11.19%</td>
</tr>
<tr>
<td>Park Ave Garage</td>
<td>6.87%</td>
</tr>
<tr>
<td>Lot 3067</td>
<td>4.58%</td>
</tr>
<tr>
<td>Lot 4578</td>
<td>4.45%</td>
</tr>
<tr>
<td>South of Sx Lot A</td>
<td>1.12%</td>
</tr>
</tbody>
</table>
Make Comparison Easier

![Pie Chart and Bar Chart Diagram]

- Pie Chart: Value A is the largest, followed by Value B, then Value C, Value D, Value E, and Value F.
- Bar Chart: Representation values range from 0 to 9, with Value A having the highest representation and Values D, E, and F having the lowest.

Legend:
- Value A: Blue
- Value B: Orange
- Value C: Gray
- Value D: Yellow
- Value E: Purple
- Value F: Green
Story: Highlight One Number

Quality of Orientation Workshops

80% "good" or "excellent"

Graduate Student Resource Center

Quality of After-Care Instructions

85% "good" or "very good"

Arthur Ashe Student Health and Wellness
Line Graphs

Appropriate Uses

- Display sequential data
- Display trends
- Highlight before-and-after differences

Tips

- Use arrows or text to highlight key events or data
- Legends and lines that help highlight slices; or directly label if possible
- Show percentages for each slice
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
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
More Things to Explore

Stephanie Evergreen’s Website: stephanieevergreen.com

Stephanie’s Qualitative Chart Chooser: http://stephanieevergreen.com/qualitative-chart-chooser/

Cole Nussbaumer’s Website: www.storytellingwithdata.com

Cole’s Video on Using Color: https://youtu.be/AiD6etOB6ql

Steven Few’s Website: www.perceptualledge.com

Nathan Yau’s Website: flowingdata.com
References


Questions?

Contact: kmckinney@saonet.ucla.edu