Agenda

8:30 AM - 9:00 AM  Breakfast
9:00 AM - 10:00 AM   Overview of data visualization theory and best practices
10:00 AM - 11:00 AM  Hands-on learning workshop

At the end of this interactive session, participants should be able to:

- Comprehend difference between a poor visual and an effective one and identify examples of each.
- Employ pre-attentive attributes to direct attention and provide a visual hierarchy of information.
- Recognize flair that doesn’t add informative value and be comfortable cutting it from visual displays.
- Know what type of visual to use given the information that is to be displayed.
- Understand affordances, accessibility, and aesthetics and how to apply these design principles to data visualizations.
- Synthesize lessons learned to transform a poor visual into an effective one.

Program Handouts

1. Evaluation Form
2. Storytelling with Data Examples & Reference Guide

Special thanks to the Bland Family Foundation for sponsoring our Grantmaker Skills & Strategies Series!
Cole Nussbaumer

Cole Nussbaumer works at Google as an analytics manager on the People Analytics team, which uses a data-driven approach to ensure that Google attracts and retains great people and that the organization is best aligned to meet business needs. Cole specializes in the effective display of quantitative information and has travelled to Google offices around the world to teach her course on data visualization.

Analyzing data in order to provide insight and drive action has been a common thread throughout Cole’s varied career. Prior to joining Google, she worked on several credit and repurchase risk projects with Cerberus Capital Management, coaching executive management on interpretation of projections and analyses. Before that, Cole managed operational risk and fraud management at Washington Mutual in Seattle.

Cole has a BS in Applied Math and an MBA with a focus in quantitative methods, both from the University of Washington. When she isn't working hard as a Googler or on her consulting work with Storytelling with Data (www.storytellingwithdata.com), Cole enjoys travelling and spending time in her kitchen, creating and blogging about her culinary adventures.

About Our Presenter

Attendees

- Althoff Catholic High School
- America SCORES St. Louis
- Beyond Housing
- Bland Family Foundation
- Boys Hope Girls Hope
- Brightman Family Fund
- Brown Sisters Foundation
- Build-A-Bear Workshop
- Cardinal Glennon Children's Foundation
- Center for Hearing & Speech
- Center for Survivors of Torture and War Trauma
- City Academy
- City of St. Charles
- College Bound
- Community Council of St. Charles County
- Connections to Success
- Cultural Festivals
- Delta Dental Health Theatre
- Delta Gamma Center for Children with Visual Impairments
- Director of Development
- East Central Missouri AHEC
- Elements Partnership
- Epworth
- Estelle and Karen Kalish Fund
- Express Scripts
- Greater East St. Louis Community Fund
- HavenHouse St. Louis
- Humanitri
- Incarnate Word Foundation
- Innovate Venture Mentoring Service
- International Institute
- KidSmart - Tools for Learning
- Kingdom House
- Lemay Child and Family Center
- Lutheran Foundation of St. Louis
- MasterCard Worldwide
- Memory Care Home Solutions
- Missouri Association for Community Action
- Missouri Association for Social Welfare (MASW)
- Missouri Botanical Garden
- Missouri Foundation for Health
- More Than Carpenter Christian Ministries
- Peter & Paul Community Services
- Planned Parenthood
- Saint Louis Effort for AIDS
- Sherwood Forest Camp
- Sigma-Aldrich
- Solutia
- St. Elizabeth Academy
- St. Louis Arc
- St. Louis Graduates
- St. Louis Regional Health Commission
- St. Louis Symphony
- Sts. Joachim and Ann Care Service
- Teach For America
- The Scholarship Foundation of St. Louis
- United Services
- United Way of Greater St. Louis
- United Way of St. Louis
- Vision for Children at Risk
- Washington University School of Medicine
- Webster University
- Words, Etc.
- Writing Works
- Wyman Center
- Youth in Need Head Start
- Youth Learning Center
- YWCA Metro St. Louis
Let’s practice!

In groups of 3-4, discuss **what you like** about the following visuals and **what you would change**.

**Goal:** to tell a clear & concise story with data (and words!).

Plan to spend about **5 minutes discussing each**.

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**1. Continued Improvements in ERB Test Results**
Test results indicate that our students are receiving the highest in most recent average test scores on these subjects: 96% for Math, 95% for Reading Comprehension.

Of course, we’re not satisfied, but in 2005-2006, only 40% of our sixth graders were scoring above average, now 90% and continuing to our progress.

**2. Educational and Quality of Life in Region in Relationship to the 35 Largest Cities**

<table>
<thead>
<tr>
<th>Region</th>
<th>Average Income (per Capita)</th>
<th>Unemployment Rate</th>
<th>Median Household Income</th>
<th>Infant Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>$50,000</td>
<td>4%</td>
<td>$50,000</td>
<td>10/1000</td>
</tr>
<tr>
<td>West</td>
<td>$60,000</td>
<td>3%</td>
<td>$60,000</td>
<td>20/1000</td>
</tr>
</tbody>
</table>

This data is self-reported by families, but matches the trends seen by our clients.

**3. Teach for America’s Effectiveness in the Classroom**

- **4. Nonprofit Support**

<table>
<thead>
<tr>
<th>Type of Nonprofit</th>
<th>Number of Nonprofits</th>
<th>% of Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts &amp; Culture</td>
<td>10</td>
<td>50%</td>
</tr>
<tr>
<td>Education</td>
<td>20</td>
<td>30%</td>
</tr>
<tr>
<td>Health</td>
<td>10</td>
<td>20%</td>
</tr>
<tr>
<td>Public Welfare</td>
<td>5</td>
<td>5%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>10%</td>
</tr>
</tbody>
</table>

Many funders giving to multiple types of organizations, reflected in this data, is decreasing, while funding to human services has increased compared to national data because respondents can choose multiple options.
Summer learning project

1. How do you feel about doing science? (Circle 1 Answer)
   PRE: (10) Bored  (5) Not great  (38) OK  (23) Kind of interested  (18) Excited
   POST: (6) Bored  (3) Not great  (7) OK  (15) Kind of interested  (19) Excited

   PRE: How do you feel about doing science?
   - Bored
   - Not great
   - OK
   - Kind of interested
   - Excited
   - 19% Bored
   - 25% Not great
   - 40% OK
   - 11% Kind of interested
   - 5% Excited

   POST: How do you feel about doing science?
   - Bored
   - Not great
   - OK
   - Kind of interested
   - Excited
   - 38% Bored
   - 14% Not great
   - 30% OK
   - 6% Kind of interested
   - 12% Excited

2. How good are you at doing science experiments?
   PRE: (4) Terrible  (5) Poor  (29) OK  (31) Good  (27) Excellent
   POST: (2) Terrible  (4) Poor  (15) OK  (24) Good  (16) Excellent

   PRE: How good are you at doing science experiments?
   - Terrible
   - Poor
   - OK
   - Good
   - Excellent
   - 28% Terrible
   - 33% Poor
   - 30% OK
   - 4% Good
   - 5% Excellent

   POST: How good are you at doing science experiments?
   - Terrible
   - Poor
   - OK
   - Good
   - Excellent
   - 26% Terrible
   - 39% Poor
   - 25% OK
   - 3% Good
   - 7% Excellent

Source: participant submission
Magnets & motors: making an impact

The summer learning program shows positive impact on elementary school children’s sentiments towards science: after the program, more children were excited about doing science and rated their skills higher than before the program.

### How do you feel about science?

<table>
<thead>
<tr>
<th>Sentiment</th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excited</td>
<td>19%</td>
<td>38%</td>
</tr>
<tr>
<td>Kind of interested</td>
<td>24%</td>
<td>30%</td>
</tr>
<tr>
<td>OK</td>
<td>14%</td>
<td>40%</td>
</tr>
<tr>
<td>Not great</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Bored</td>
<td>11%</td>
<td>12%</td>
</tr>
</tbody>
</table>

### How would you rate your science experiment skills?

<table>
<thead>
<tr>
<th>Skill Level</th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>28%</td>
<td>26%</td>
</tr>
<tr>
<td>Good</td>
<td>32%</td>
<td>39%</td>
</tr>
<tr>
<td>OK</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>Poor</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Terrible</td>
<td>4%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Continued Improvements in ERB Testing Scores

Test results indicate that our students are thriving as a result of our departmentalized program. We recently received the results of our most recent ERB standardized test. The following percentage of 6th graders scored average to above average in these subjects:

- Math 96%
- Quantitative Reasoning 89%
- Reading Comprehension 94%
- Verbal Reasoning 100%
- Vocabulary 100%
- Writing Concepts and Skills 95%
- Writing Mechanics 100%

Of course, we are not fully satisfied, but this shows tremendous growth. When the test was first administered in 2005-2006, only 40% of our sixth graders scored above the 50th percentile in reading, and only 10% in math. We continue to look critically at our program and explore ways we can better meet the needs of our students.
Students are thriving

There has been tremendous improvement in standardized test scores.

When the ERB standardized test was first administered in 2005-2006, only 40% of our 6th graders scored above the 50th percentile in reading and only 10% in math. This year’s test results show significant improvement:

6th Grade ERB Test Results

<table>
<thead>
<tr>
<th></th>
<th>% scoring above average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Reasoning</td>
<td>100%</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>100%</td>
</tr>
<tr>
<td>Writing Mechanics</td>
<td>100%</td>
</tr>
<tr>
<td>Math</td>
<td>96%</td>
</tr>
<tr>
<td>Writing Concepts &amp; Skills</td>
<td>95%</td>
</tr>
<tr>
<td>Reading Comprehension</td>
<td>94%</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>89%</td>
</tr>
</tbody>
</table>
Quality of Life Indicators

Economic, Educational and Quality of Life Indicators – Rank of the St. Louis Region in Relationship to the 35 Largest U. S. Metro Areas

<table>
<thead>
<tr>
<th>Gross Metropolitan Product</th>
<th>St. Louis Region Rank and (Raw Data)</th>
<th>U. S. Average (Raw Data)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>33rd ($39,631)</td>
<td>($49,230)</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>12th (9.9%)</td>
<td>9.1%</td>
</tr>
<tr>
<td>Median Household Income</td>
<td>23rd ($51,691)</td>
<td>($55,698)</td>
</tr>
<tr>
<td>Families in Poverty</td>
<td>18th (9.7%)</td>
<td>9.6%</td>
</tr>
<tr>
<td>Infant Mortality Rate</td>
<td>9th (7.9)</td>
<td>6.7</td>
</tr>
<tr>
<td>Lacking basic prose skills</td>
<td>6.9%</td>
<td></td>
</tr>
<tr>
<td>High School Attainment</td>
<td>15th (27.6%)</td>
<td>26%</td>
</tr>
<tr>
<td>College Attainment</td>
<td>27th (17.8%)</td>
<td>20.4%</td>
</tr>
</tbody>
</table>

Source: participant submission
Education focus is beginning to impact metrics

Programs focusing on increasing high school graduation are beginning to pay off: we already see improvement in college attainment and unemployment rate compared to the US average. Over time, we expect this will help close the income gap.

### Economic, Educational, and Quality of Life Indicators

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Rank</th>
<th>St. Louis</th>
<th>US Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant mortality rate</td>
<td>9th</td>
<td>17.8%</td>
<td>20.4%</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>12th</td>
<td>9.7%</td>
<td>9.6%</td>
</tr>
<tr>
<td>High School attainment</td>
<td>15th</td>
<td>27.6%</td>
<td>26.0%</td>
</tr>
<tr>
<td>Families in poverty</td>
<td>18th</td>
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<td>Gross metropolitan product</td>
<td>33rd</td>
<td>$39,631</td>
<td>$49,230</td>
</tr>
</tbody>
</table>
Types of nonprofits supported

This data is self-reported by funders, but closely matches the trends seen from the nonprofit surveys from this time period.

Types of Nonprofits Supported by Area Funders (% of total respondents by year)

Many funders giving to multiple types of organizations, reflected in this bar graph. Over time, funding to education has decreased, while funding to human services has increased. This data cannot be exactly compared to national data because respondents can choose multiple answers.

Source: participant submission
Types of nonprofits supported by area funders

% of total respondents by year*

2006 2007 2008 2009 2010 2011
Many funders in our area give to multiple types of organizations, as shown in the graph on the right.

Observations: over time, funding to **arts & culture** and **education** has decreased, while funding to **human services** has increased.

*Percents sum to greater than 100 because respondents can choose multiple answers. This data is self reported by funders, but closely matches the trends seen from the nonprofit surveys from this time period.*
Teach for America’s effectiveness

Findings:

• In their first two years teaching in St. Louis Public Schools, Teach for America • St. Louis corps members are outperforming veteran teachers.

• Knowing where we are allows us to be purposeful and strategic in supporting our teachers to get even better.

• Our work is cut out for us. We need our teachers consistently performing at an absolute bar of excellence to close the achievement gap.

• We hold ourselves completely accountable for student-level outcomes.

Source: participant submission
**Teach for America: clear classroom benefits**

- In their first two years teaching in St. Louis Public Schools, Teach for America corps members are outperforming veteran teachers.

- Knowing where we are allows us to be purposeful and strategic in supporting our teachers to get even better.

- Our work is cut out for us. We need our teachers consistently performing at an absolute bar of excellence to close the achievement gap.

- We hold ourselves completely accountable for student-level outcomes.

---

**Average Teacher Percentile, 2009-10**

- **Teach for America Corps Members**
- Non-Teach for America Teachers
- Non-Teach for America Novice Teachers*

The above compares the performance of all Teach for America corps members in St. Louis to non-Teach for America teachers in St. Louis public schools.

*Novice teachers are non-Teach for America teachers in their 1st or 2nd year teaching.
1 choose the right type of display
   • When highlighting a number of two, simple text is best
   • Use pie charts cautiously!
   • Use line charts to show continuous data; bar charts for categorical data
   • Let the relationship you want to show guide the type of chart you choose

2 eliminate clutter
   • Use contrast strategically – don’t let your message get lost in the clutter!
   • Leverage Gestalt principles to cut that which has no informative value

3 draw attention where you want it
   • Understand the power of preattentive attributes (color, size) and use selectively to
     (1) direct your audience’s attention and (2) provide a visual hierarchy of information

4 tell a visual story
   • Text is your friend: use it to title/label, explain, and tell a story

5 practice makes perfect
   • Seek feedback from colleagues; iterate for success
storytelling with data: quick reference guide

Preattentive attributes

- Orientation
- Shape
- Line Length
- Line Width
- Size
- Curvature
- Added Marks
- Enclosure
- Hue
- Intensity
- 2-D Position
- Flicker Direction
- Motion
  - Quantitatively perceived

Gestalt principles

- Proximity
- Similarity
- Enclosure
- Closure
- Continuity
- Connection

The path to great design

**Affordances**
- Highlight the important stuff
- Eliminate distractions

**Accessibility**
- Don’t overcomplicate
- Text is your friend

**Aesthetics**
- Be smart with color
- Alignment & white space

Additional resources

cole’s favorite data viz books:
- Show Me the Numbers (Few)
- Information Visualization (Ware)
- WSJ Guide to Information Graphics (Wong)
- The Visual Display of Quantitative Information (Tufte)

Find more resources at www.storytellingwithdata.com
Follow cole on Twitter at storywithdata