

# Lecture 12: Storytelling, Accessibility and Interactivity

April 20, 2026

# Course Administration

- 1 Tutorial 9 quiz – final quiz

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- ② Final Trachtenberg Listens April 23, 4 to 6 pm, 601Y [registration [link](#)]

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  - 3:30 to 5:20 both days
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- ⑦ Anything else?

Today

# Today

- ① Accessibility
- ② Storytelling
- ③ Interactivity

# Accessibility

## GWU's Digital Accessibility Goals

- ① **Perceivable:** The information should be presented in a way all users can “see” or perceive it. No content should be hidden.
- ② **Operable:** The user interface should be operable with any device or software tool, such as a keyboard, touchscreen, or screen reader.
- ③ **Understandable:** In addition to being able to operate the user interface, users must be able to understand the information presented.
- ④ **Robust:** Content should adhere to guidelines and best practices to ensure it can be interpreted by a variety of devices and assistive technologies.

Directly from [this page](#)

# What Does This Mean for Graphics?

Again, from GW's standards

- “Users with visual impairments, cognitive challenges or technical limitations may not be able to see the images that are on a webpage. For this reason, it is necessary to provide alternative text on all images. The alternative text information is then displayed as plain text, read aloud via a screen reader, or output using a braille reader.”
- And further on “text on graphics”
  - “When possible, use text rather than images to convey information. Text can be magnified, interpreted as braille, or read aloud using screen readers by visually-impaired users.”
  - “Using text on graphics is not best practice and should be avoided when possible. However, in instances where text inside of graphics is used (e.g., logos), you must provide alt text that communicates the text to screen reader and assistive technology users.”

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Some of this is diametrically opposed to what I've been teaching you in this class.

# What is Digital Accessibility for Graphics?

- A still-open question

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- People with little numeracy

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  - Annotations help

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  - Prevalence up to 8 percent for White men
  - Lower for non-Whites (Xie JZ, et al, *Ophthalmology*. 2014.)
  - Near zero for women

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- Visually impaired people

# Potential Solutions

Things that are better for almost everyone

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- Labels directly on graphics (apologies to above)
- Line thickness
- Annotations on graphics
- White spaces between colors
- Omit legends only viewable by hovering

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Things that are better for some and worse for others

## Potential Solutions

Things that are better for almost everyone

- Labels directly on graphics (apologies to above)
- Line thickness
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- Omit legends only viewable by hovering

Things that are better for some and worse for others

- Patterns or fills for bars
- Dashed lines rather than colors
- Lines with different shapes

# What To Do?

## What To Do?

- Link to the data
- Provide alternative text – seems worse than mediocre
- Be careful in choosing colors
  - Color Brewer has colorblind safe colors
  - [Colorsafe](#) has accessible palettes
  - Simulate how a colorblind person sees this at [Colblindor](#)
- Consult [Web Content Accessibility Guidelines](#)

Thanks to the U of Wisconsin's [site](#)

# Telling Stories

# Three Parts of Storytelling

- ① The Sequential Story
- ② The Proportional Story
- ③ A Fix from Knaflic

# Three Parts of Storytelling

- ① The Sequential Story
- ② The Proportional Story
- ③ A Fix from Knaflic

Throughout, we'll try to identify sub-component design as in Few.

## 0. The Details: Few

How many small decisions impact the overall look and story. Few's “secondary data component design”

- trend lines
- reference lines
- annotations
- scales
- tick marks
- grid lines
- legends

# 1. The Sequential Story

- Knaflic: narrate a line graph
- Mulbrandon: narrate a set of line graphs

## Sequential Stories

- Tell the story of change over time
- Highlight important inflection points
- Tell the audience how you characterize the change: big, small, steep, not
- Use a different final product for the un-narrated version

## Knaflic's Sequential Story: Presentation version

### Moonville: active users over time



Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

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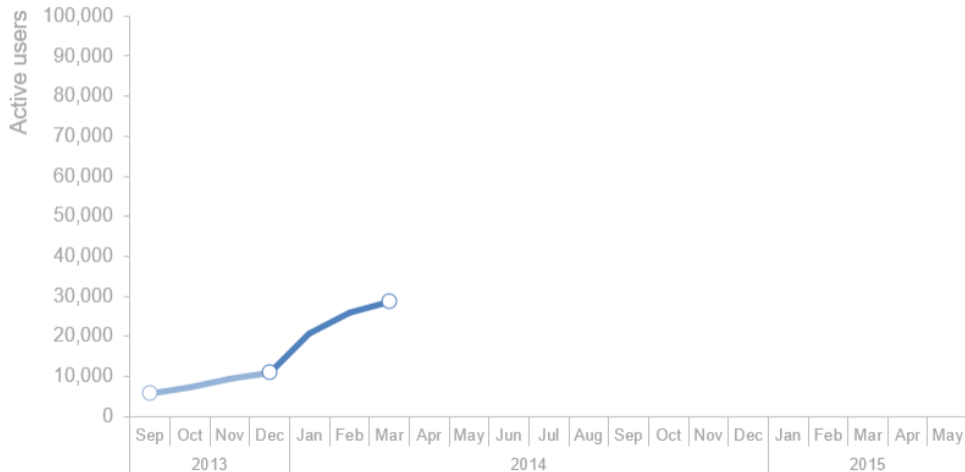
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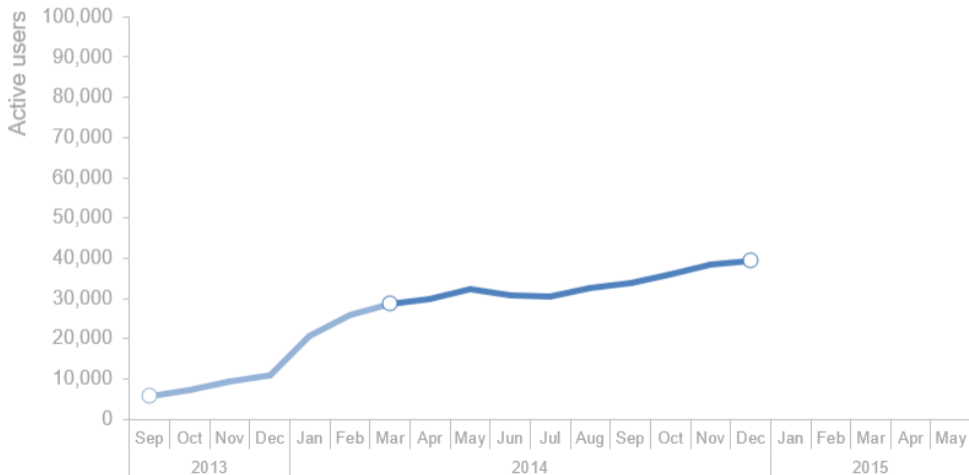
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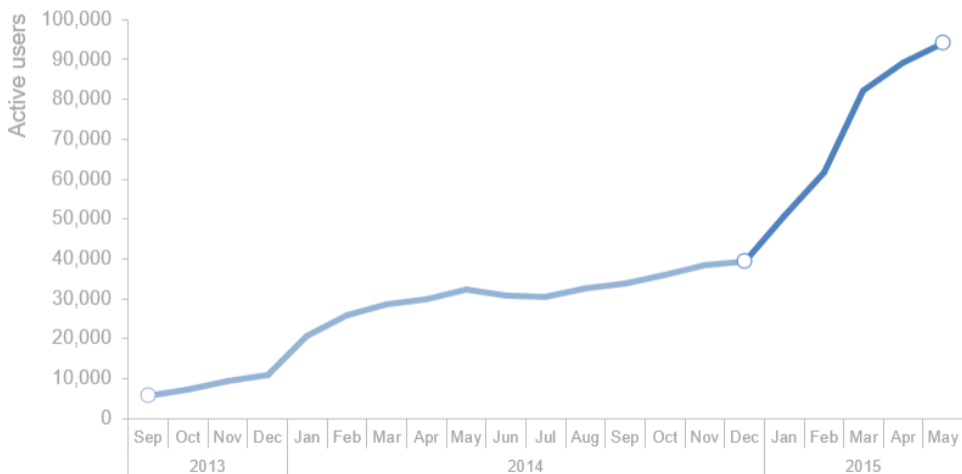
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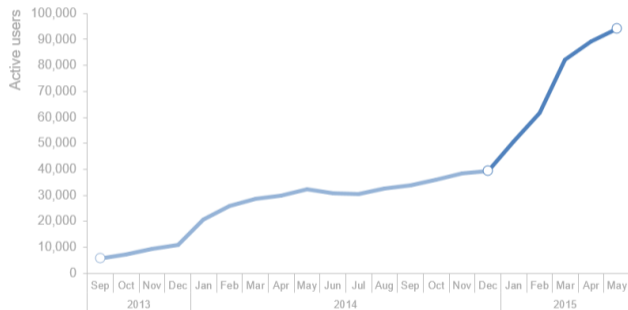
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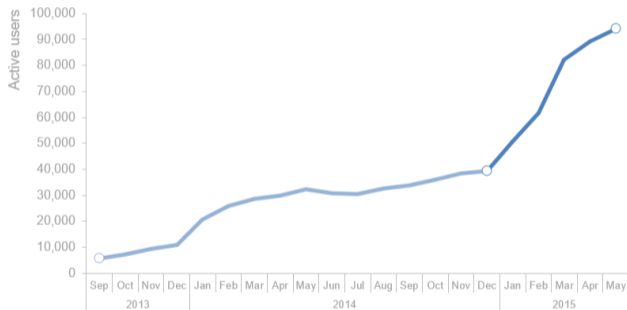


Few's secondary components

Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

# Knaflic's Sequential Story: Presentation version

Moonville: active users over time



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## Few's secondary components

- noisy but easy to read ticks
- dots function as annotations

# Knaflic's Sequential Story: Paper Version

## Moonville: active users over time



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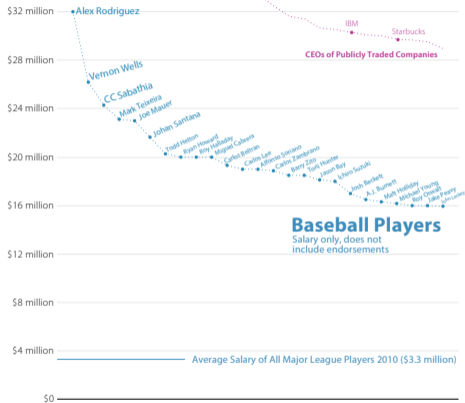
## Few's secondary components

- heavy annotations
- color for main point
- clever: text divides periods

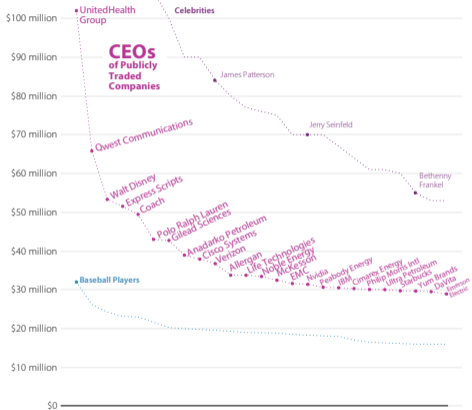
## Sequence in Size: Mulbrandon and Top Salaries

- These charts manage to show things that don't actually fit on the same scale
- Impossible in one graph, but possible in two
- And notice that this is a line graph not in time

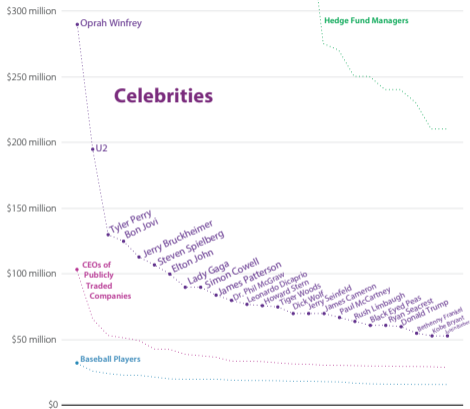
# Top Major League Baseball Salaries



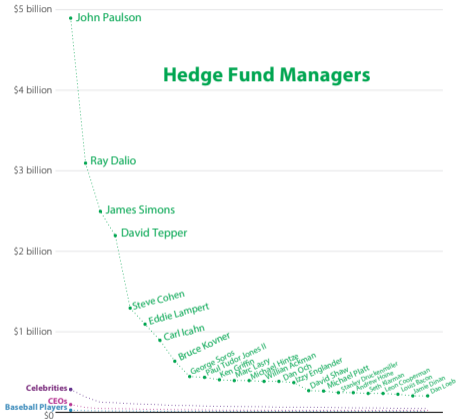
# Top CEO Compensation



# Top Celebrity Income

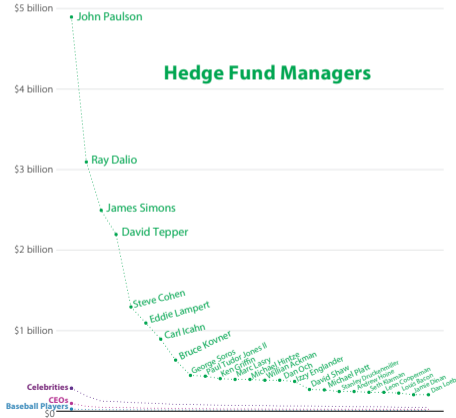


# Top Hedge Fund Manager Income



# What Would Few Say?

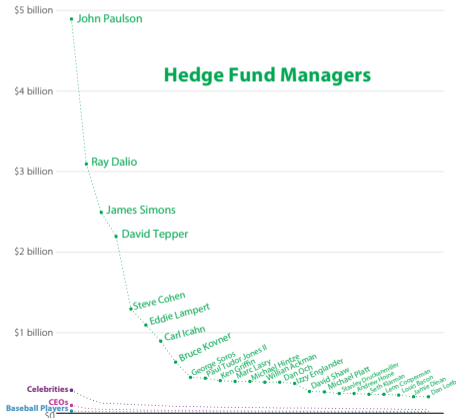
2010  
Top Hedge Fund Manager Income



Few's secondary components

# What Would Few Say?

2010  
Top Hedge Fund Manager Income



Few's secondary components

- x axis is rank
- labels on graphs
- colors to divide occupations
- labels for names
- reference line for baseball
- foreshadowing

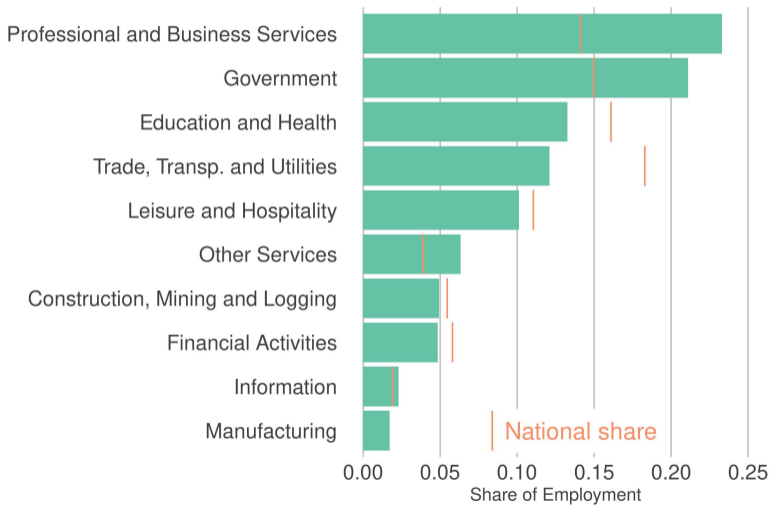
## 2. The Proportional Story

- Me: DC vs the US
- Knaflic: narrate a set of stacked bars
- Mulbrandon: narrate a set of dots
- Knaflic: legend on the top

## Proportional Stories

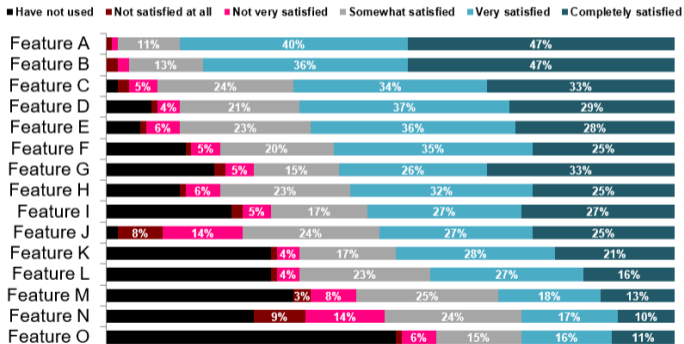
- Show how one item's size relates to another item's size
- For multiple items, call out specific size differences
- Tell the audience how you characterize the relative magnitude: big or small?

# DC Industrial Mix vs Rest of the Country



# Knaflic's Proportion Considerations: Presentation version

How satisfied have you been with each of these features?

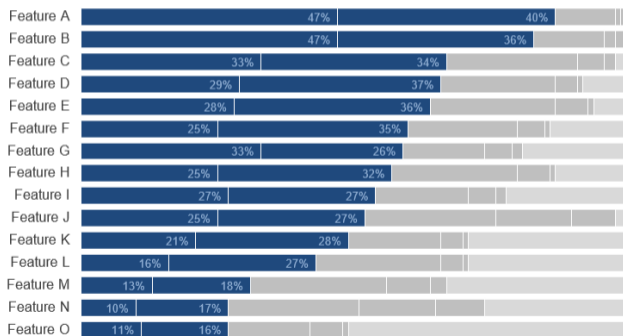


# Knaflic's Proportion Considerations: Presentation version

## Features A & B top user satisfaction

### Product X User Satisfaction: **Features**

■ **Completely satisfied** ■ **Very satisfied** ■ Somewhat satisfied ■ Not very satisfied ■ Not satisfied at all ■ Have not used



Responses based on survey question "How satisfied have you been with each of these features?".

Need more details here to help put this data into context: How many people completed survey? What proportion of users does this represent?

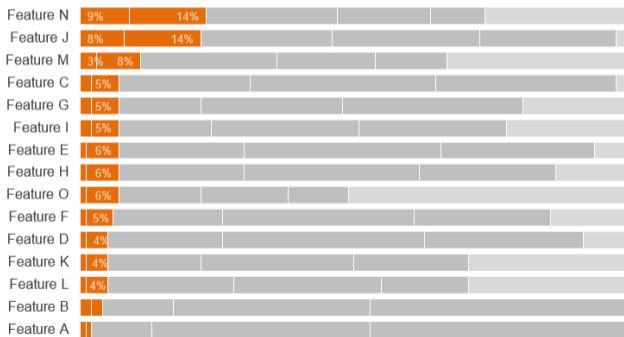
Do those who completed survey look like the overall population, demographic-wise? When was the survey conducted?

# Knaflic's Proportion Considerations: Presentation version

## Users least satisfied with Features N and J

### Product X User Satisfaction: **Features**

■ **Not satisfied at all** ■ **Not very satisfied** ■ Somewhat satisfied ■ Very satisfied ■ Completely satisfied ■ Have not used



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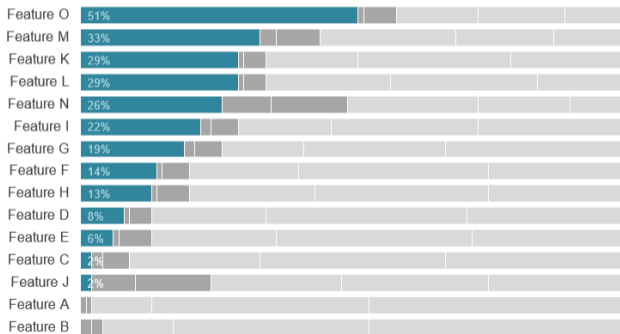
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## Feature O is least used

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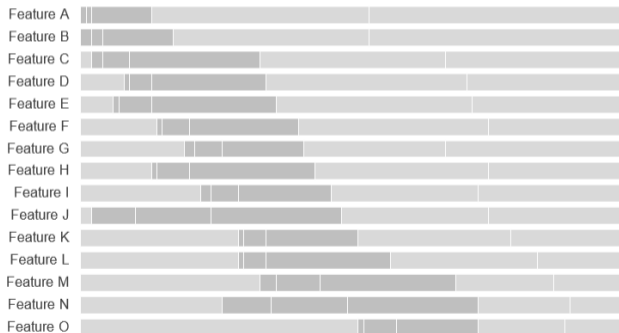
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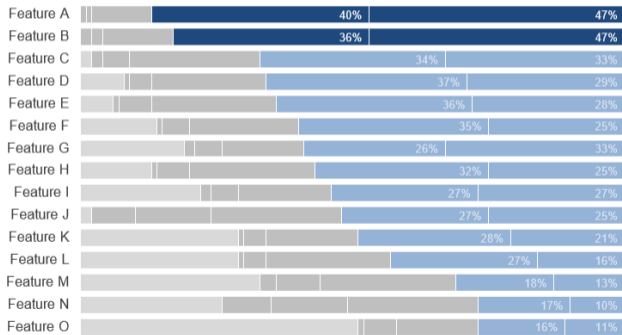
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Features A and B  
continue to top  
user satisfaction

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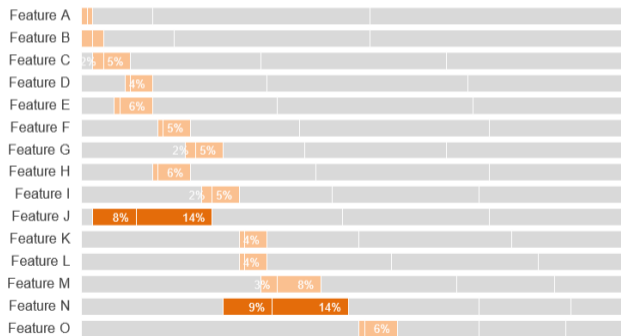
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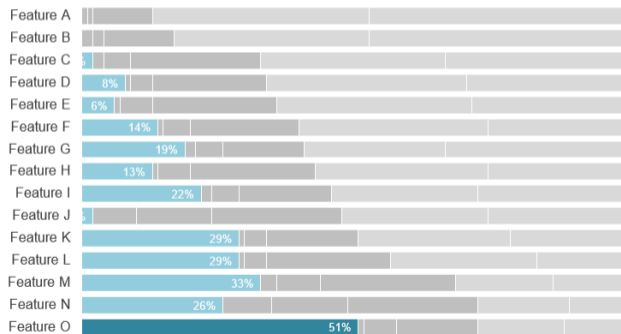
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Feature O is least used. What steps can we proactively take with existing users to increase utilization?

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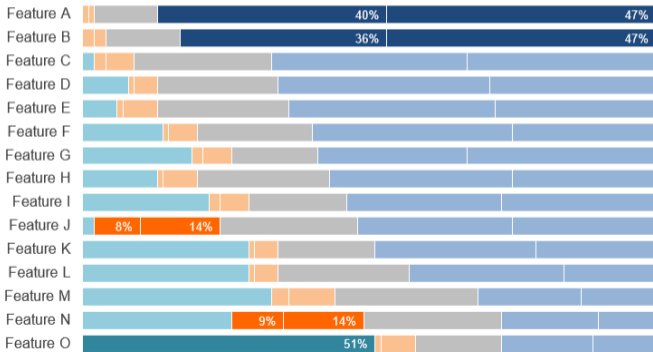
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Features A and B continue to top user satisfaction

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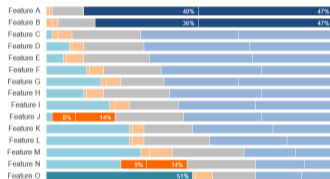
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## Few's secondary components

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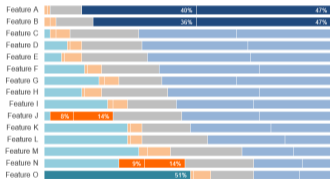
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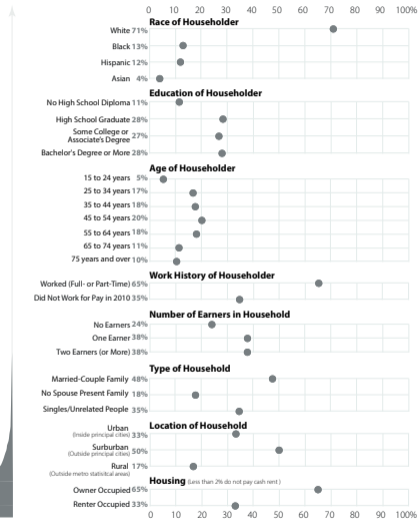
## Few's secondary components

- color and shades of color
- annotation near graphic in matching color
- bright color to emphasize
- no ticks
- no scale!
- labels at top

# Mulbrandon on the Relative Size of Things

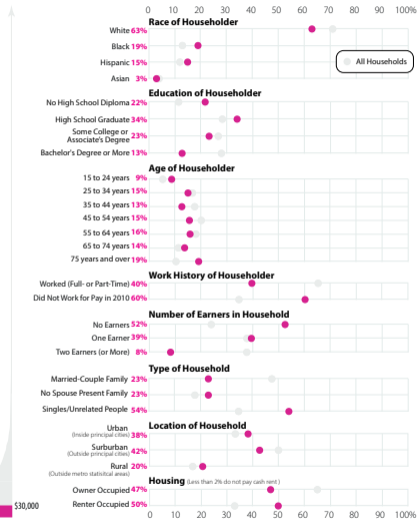


# Demographics of All Incomes





# Demographics of Incomes below \$30,000

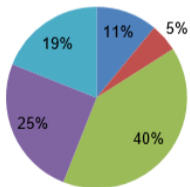


## Improving on Pie Charts for Comparisons

### Survey results: summer learning program on science

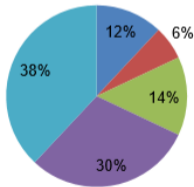
**PRE: How do you feel about doing science?**

■ Bored ■ Not great ■ OK ■ Kind of interested ■ Excited



**POST: How do you feel about doing science?**

■ Bored ■ Not great ■ OK ■ Kind of interested ■ Excited



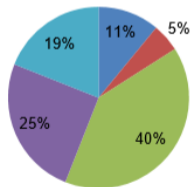
Which numbers do you want viewers to compare?

## Improving on Pie Charts for Comparisons

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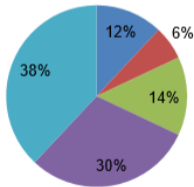
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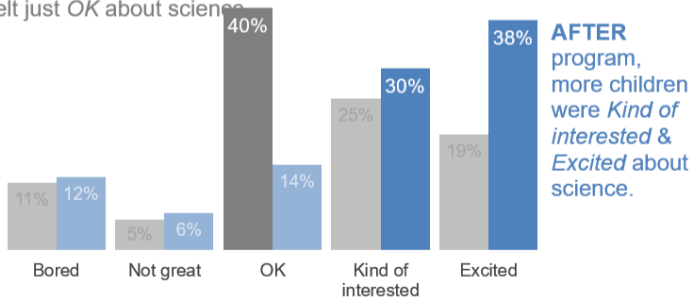
Which numbers do you want viewers to compare? Knaflic offers 5 options. I show 3.

# Improving on Pie Charts for Comparisons

## Pilot program was a success

How do you feel about science?

**BEFORE** program, the majority of children felt just *OK* about science.

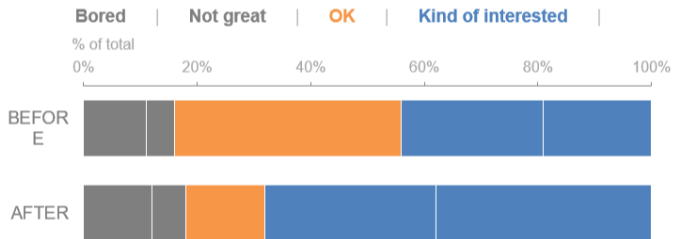


Based on survey of 100 students conducted before and after pilot program (100% response rate on both surveys).

# Improving on Pie Charts for Comparisons

## Pilot program was a success

How do you feel about science?



BEFORE program, the majority of children (40%) felt just OK about

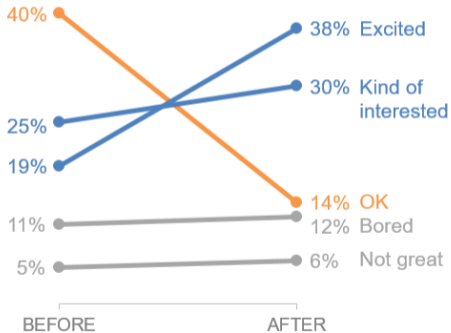
AFTER program, more children were Kind of interested (30%) & Excited

Based on survey of 100 students conducted before and after pilot program (100% response rate on both surveys).

# Improving on Pie Charts for Comparisons

## Pilot program was a success

How do you feel about science?



BEFORE program, the **majority of children felt just OK** about science

AFTER program, more children were *Kind of interested &*

Based on survey of 100 students conducted before and after pilot program (100% response rate on both surveys).

### 3. The Fix

Knaflic's fix of an existing graphic to highlight the story

- Instead of the book's example, another from her website
- Transforming hard-to-read bars to easier-to-read formats
- Many similar ideas apply
- I'll just narrate the first one

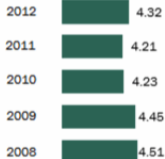
# Pew Charts on Number of Newly Married Adults

What's Wrong and How to Fix?

ORIGINAL

## Number of Newly Married Adults

*In millions*



Note: "Newly married" refers to adult respondents who reported marrying within the past twelve months of the interview.

Source: Pew Research Center tabulations of the 2008-2012 American Community Survey (ACS) data

PEW RESEARCH CENTER

# Show Change Over Time

## ORIGINAL

### Number of Newly Married Adults

*In millions*



Note: "Newly married" refers to adult respondents who reported marrying within the past twelve months of the interview.

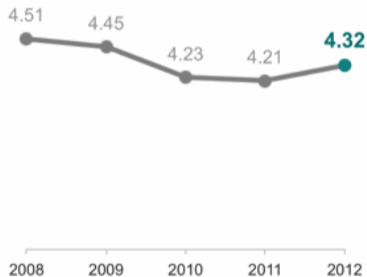
Source: Pew Research Center tabulations of the 2008-2012 American Community Survey (ACS) data

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## COLE's MAKEOVER

### Number of Newly Married Adults

*In Millions*



"Newly married" refers to adult respondents who reported marrying within the past twelve months of the interview.

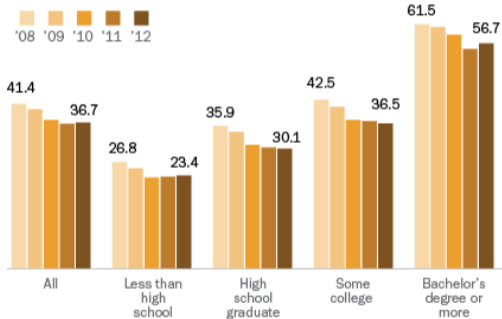
Source: Pew Research Center tabulations of the 2008-2012 American Community Survey (ACS) data.

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# Can You Pick Out the Point Here?

## New Marriage Rate by Education

*Number of newly married adults per 1,000 marriage eligible adults*



Note: Marriage eligible includes the newly married plus those widowed, divorced or never married at interview.

Source: US Census

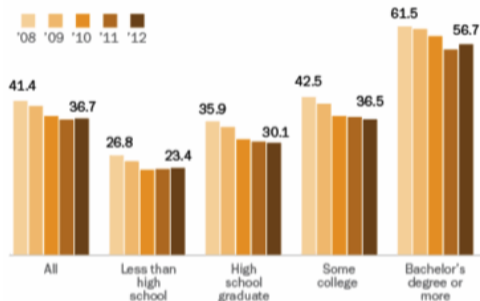
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# Highlighting the Increase for You Guys

## ORIGINAL

### New Marriage Rate by Education

Number of newly married adults per 1,000 marriage eligible adults



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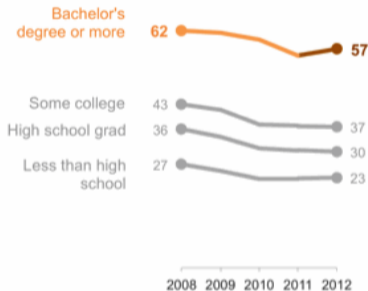
Source: US Census

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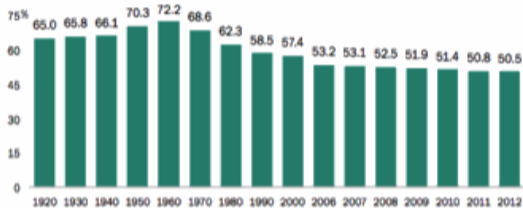
Source: US Census

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# What Would You Want to Pull Out?

ORIGINAL

## Adults Currently Married



Notes: Based on adults age 18 and older. Currently married includes respondents reporting "married, spouse absent." Those reporting "separated" are not included in "currently married."

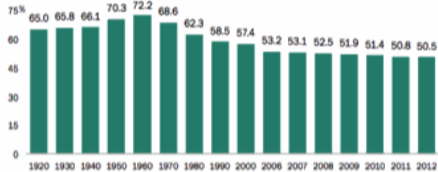
Source: Pew Research Center tabulations of the 1920-2000 Decennial Census data and 2006-12 American Community Survey (ACS) Integrated Public Use Micro Samples

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# Highlighting Peak and Trough

## ORIGINAL

### Adults Currently Married



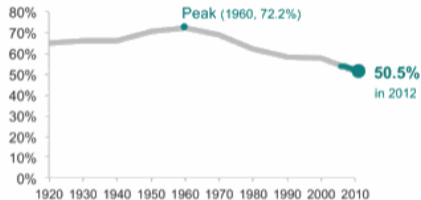
Notes: Based on adults age 18 and older. Currently married includes respondents reporting "married, spouse absent." Those reporting "separated" are not included in "currently married."

Source: Pew Research Center tabulations of the 1920-2000 Decennial Census data and 2006-12 American Community Survey (ACS) Integrated Public Use Micro Samples

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## COLE's MAKEOVER

### Adults Currently Married



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Source: Pew Research Center tabulations of the 1920-2000 Decennial Census data and 2006-12 American Community Survey (ACS).

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# Interactivity

# Interactivity

- ① What is an interactive graph?
- ② Why do you want an interactive graph?
- ③ When should use an interactive graph?
- ④ How do you make an interactive graph?



# Why Do You Want An Interactive Graphic?

To explore.

# Why Do You Want An Interactive Graphic?

To explore.

- Not great for making one clear point
- Great for letting readers peruse the data
- Great for showing specific values as needed

## When Should You Use an Interactive Graph?

- When you want to provide data details + chart
- When you want to move stuff around

## How Do You Make Interactive Graphics?

- R has via RShiny – kind of clunky

# How Do You Make Interactive Graphics?

- R has via RShiny – kind of clunky
- Leading programs
  - Datawrapper, Tableau
  - Fully customizable: D3

# How Do You Make Interactive Graphics?

- R has via RShiny – kind of clunky
- Leading programs
  - Datawrapper, Tableau
  - Fully customizable: D3
- Today's tutorial is based on D3
- Syntax is **complicated**
- Work with AI to get it right

Sample chart

# In Conclusion

## Your Goal



### George Balanchine

- preeminent 20th century ballet choreographer
- born in Russia
- emigrated to escape persecution
- artistic director of New York City Ballet for > 30 years

## Your Goal



### George Balanchine

- preeminent 20th century ballet choreographer
- born in Russia
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**“They look but they do not see.  
So we must show them.”**

## Next Classes

- See you for presentations next week
- Office hours available until papers are in
- Best of luck wrapping up