CSE 332
Introduction to Visualization

Infographics Design

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A clipped compound of "information" and "graphics"

A graphic visual representations of information, data or knowledge intended to present information

- quickly
- clearly

Can improve cognition by utilizing graphics to enhance the human visual system's ability to see patterns and trends
Graphical displays should

- show the data
- induce the viewer to think about the substance rather than about methodology, graphic design, the technology of graphic production, or something else
- avoid distorting what the data has to say
- present many numbers in a small space
- make large data sets coherent
- encourage the eye to compare different pieces of data
- reveal the data at several levels of detail, from a broad overview to the fine structure
- serve a reasonably clear purpose: description, exploration, tabulation, or decoration
- be closely integrated with the statistical and verbal descriptions of a data set.
Minard’s 1869 map of Napoleon’s campaign to Russia

Shows 6 variables in one 2D visualization:
- number of Napoleon's troops, temperature
- distance traveled, direction of travel
- latitude and longitude, location relative to specific dates
Some More Random Examples ...
The Time We Spend on the Internet

- We send over 200 million emails per minute.
- Almost 6 billion videos are watched on YouTube every single day with an average viewing time of 40 minutes.
- The average adult spends more than 20 hours online a week...

...which includes time spent on the Internet at work.

Stress in the Workplace

- 70% of American workers experience stress-related illnesses.
- 34% think they'll burn out on the job in the next two years.
- 33% of entrepreneurs said they were stressed.
- 45% more heart attacks are occurring on Monday mornings.

The Average Work Week

- You get 168 hours a week.
- The average work week is closer to 50 hours than 40.
- The average commute time is 47 minutes round trip.
WHAT ARE WE EATING?
What the Average American Consumes in a Year

- Fats & Oils: 85.5 lbs
- Red Meat: 110 lbs
- Poultry: 73.6 lbs
- Fish & Shellfish: 16.1 lbs
- Eggs: 32.7 lbs
- Cheese: 31.4 lbs
- Dairy Products (non-cheese): 600.5 lbs
- Coffee, Cocoa & Nuts: 24 lbs
- Fruits: 273.2 lbs
- Vegetables: 415.4 lbs
- Corn: 56 lbs
- Caloric Sweeteners: 134.1 lbs
- Wheat Flour: 15 lbs
- Beverage Milks: 18.1 lbs

The Average American
- Age: 36.6
- Height: 5'9" (m) 5'4" (f)
- Weight: 190 lbs (m) 164 lbs (f)

Total Annual Consumption: 9,963.3 lbs
There are 1.4 Billion students on Earth. Only 65.2 Million educators globally.

**THE CHALLENGE:** Too many children remain out of school, and those who are in school aren’t learning the skills they need for life and work.

- **Children leaving school before completing their Primary Education**
  - In the Sub-Saharan, 11.07 million children leave school before completing their primary education.
  - In South and West Asia, that number reaches 13.54 million.

- **Children out of primary school**
  - 61 Million children are still out of primary school.
  - 32 Million of these children are girls.
  - 1 in 5 children are not using their 15 to 24 years to complete primary school and lack skills for work.

- **An estimated 250 million children are not able to read or write.**
  - The poorest and most marginalized are the most affected.

- In some emerging economies, **3 in 10 youths cannot do basic arithmetic.**

- Fragile and conflict-affected countries account for more than **30%** of all children not completing primary school.

- **Of the 775 million illiterate adults, two-thirds are women.**
STUDENT BULLYING

Bullying

Physical, verbal, or psychological attacks or intimidation against a person who cannot properly defend himself or herself. It includes two key components: 1. Repeated harmful acts 2. Imbalance of power

EFFECTS OF BULLYING
Bullying can have a significant impact on both child and teenage students. Students who are bullied often suffer from anxiety, fear, withdrawal, low self-esteem, and poor concentration. A bullied student will often avoid school, have lower grades, and become socially isolated. There have been numerous reports of suicide due to bullying.

EFFECTS ON BULLIES
Bullying is often a warning sign that children and teens are heading for trouble and are at risk for serious violence. Teens (particularly boys) who bully are more likely to engage in other antisocial/insubordinate behavior (e.g., vandalism, shoplifting, truancy, and drug use) into adulthood. They are four times more likely than nonbullies to be convicted of crimes by age 24, with 60 percent of bullies having at least one criminal conviction.

WORST STATES TO LIVE IN FOR BULLYING K-12
1 OUT OF 4 STUDENTS WILL BE ABUSED BY ANOTHER YOUTH
1 OUT OF 5 ADMIT TO BEING A BULLY, OR DOING SOME “BULLYING”

MOST COMMON TYPES OF BULLYING:
HITTING, THREATENING, INTIMIDATING, MALICIOUSLY TEASING AND TAUNTING, NAME-CALLING, MAKING SEXUAL REMARKS, AND STEALING OR DAMAGING BELONGINGS OR MORE SUBTLE, INDIRECT ATTACKS (SUCH AS SPREADING RUMORS OR ENCOURAGING OTHERS TO REJECT OR EXCLUDE SOMEONE).

PLAYGROUND SCHOOL BULLYING STATISTICS
EVERY 7 MINUTES A CHILD IS BULLIED

ADULT INTERVENTION: 11%  PEER INTERVENTION: 4%  NO INTERVENTION: 85%

43% FEAR HARASSMENT IN THE BATHROOM AT SCHOOL

77% OF STUDENTS ARE BULLIED MENTALLY, VERBALLY, & PHYSICALLY. CYBER BULLYING STATISTICS ARE RAPIDLY APPROACHING SIMILAR NUMBERS.

SOURCES:
http://www.cops.usdoj.gov
www.keepphysicsafe.org
www.bullypublic.org

PRODUCED BY:
Buckfire & Buckfire PC
www.buckfirelaw.com
Five steps (from Venngage.com)
1. Outline the goals of your infographic
2. Collect data for your infographic
3. Visualize the data for your infographic
4. Layout your infographic using an infographic template
5. Add style to your infographic design
Step 1: Outline Your Goals

Use the question pyramid

- **1 Burning Problem**: The main question the infographic will answer.
- **2-3 Supporting Questions**: Questions to provide information (what, which).
- **1-2 Probing Questions**: Questions to provide insight (why).
EXAMPLE: FOOD – WINE PAIRING

Burning Problem
How to pair food and wine

Supporting Questions
Which food components matter?
What are the types/categories of wine?
Which category works with each component?

Probing Questions
Why do certain pairings work better?
We discussed this
Step 3: Visualize the Data

Decide what are your primary goals

- what data aspect do you want to convey

The ICORE method

- Inform,
- Compare,
- Change,
- Organize,
- Reveal relationships, or
- Explore.

Venngage.com
Make a numerical stat stand out with large, bold, colorful text:

The brain makes 700 neural connections per second before the age of 5.

Demand extra attention by pairing icons with text:

4200
VACCINES ADMINISTERED

Highlight a percentage or rate with a donut chart or a pictograph:

25% WERE CHILDREN

25% WERE CHILDREN
COMPARE

Show similarities or differences among values or parts of a whole.

Use a pie chart, donut chart, pictograph, or tree map to compare parts of a whole.

Use a stacked bar chart or stacked column chart to compare categories and parts of a whole.

Use a stacked area chart to compare trends over time.
Show trends over time or space

Use a line chart or an area chart to show changes that are continuous over time.

LINE CHART

AREA CHART

Use a timeline to show discrete events in time.

TIMELINE

Use a choropleth map to show spatial data.

CHOROPLETH MAP

Use a map series to show data that changes over both space and time.

MAP SERIES

Venngage.com
Use a list to show rank or order when you want to provide extra information about each element.

```
1
2
3
```

Use a table to show rank or order when you want readers to be able to look up specific values.

```
<table>
<thead>
<tr>
<th>Cars</th>
<th>Motorcycles</th>
<th>Phones</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMW</td>
<td>Suzuki</td>
<td>Lenovo</td>
</tr>
<tr>
<td>Aston Martin</td>
<td>Yamaha</td>
<td>Samsung</td>
</tr>
<tr>
<td>Bentley</td>
<td>Harley-Davidson</td>
<td>Huawei</td>
</tr>
</tbody>
</table>
```

Use a flowchart to show order in a process.

Otherwise, show rank or order with a bar chart, column chart, bubble chart, or pyramid chart.
Reveal more complex relationships among things

Use a scatter plot when you want to display two variables for a set of data.

Use a multi-series plot when you want to compare multiple sets of related data.

Venngage.com
Add interaction
- filtering, sorting, and drilling down
- can’t do with a static chart
- but useful for online infographics displays
- will discuss later
Create a natural flow
- could use the question pyramid to guide the layout
- burning question into header
- follow with charts to address the supporting questions
- finish with the probing questions

Use a grid layout
- guides the reader’s eye
- symmetrical grid
- consider that people read
  - top to bottom
  - left to right

Venngage.com
One Column for Linear Flow
Two Columns for Comparisons

Venngage.com
Who Said What?

Democrats

- Character: 11
- Jobs: 14
- War: 9
- Hurricane: 8
- McCain: 18
- God: 6
- Bush: 18
- Economy: 16
- Iraq: 12
- Change: 24

Number of times words were used

Republican

- God: 25
- Character: 14
- Energy: 18
- Bush: 6
- Economy: 18
- Terror: 12
- Jobs: 8
- Iraq: 15
- Tax(es): 22

The Words They Used - Graphic - NYTimes.com
Three Column Example

CLean Water Systems

2.64 Billion
people around the world
do not have access
to adequate sanitation

780 Million
people do not have access
to improved water sources

Every $1
spent on water and
sanitation generates at least
$4 in increased productivity

SOURCE
Multi-Section Layout For Random Visual Access

Venngage.com
Step 5: Add Style

Overall goal
- make your infographics aesthetically pleasing
- make it easy to consume and understand

Minimize text
- should supplement the visuals
- short paragraphs (at most) at about a grade six reading level

Use font to point out importance
- readable font for the bulk of the text,
- amp up size and style of your main header, section headers, and data highlights
- make sure that the gist of your infographic is immediately apparent
Repeat basic shapes to reinforce the underlying grid.
Emphasize Using Shapes

Use basic shapes to emphasize headers and list elements
Add icons to reinforce important concepts in the text

- keep icon color, style, and size consistent
- pull everything together with extra background shapes

Venngage.com
BE Diligent

Make sure the repeated elements you add are aligned!
Negative space is often used in advertising:
- the space around and between the subject of an image
- helps to define a subject
- helps emphasizing a message
Just as important as any other element of a design

- simplest negative space are margins around the graphics
Use gaps between unrelated elements

- makes it easier to immediately understand which elements are grouped together
Much easier to make colors play nicely with each other by adding a little whitespace.
Use color to highlight important information

Venngage.com
Color for Grouping

Use color to group related elements together

Venngage.com
Neutral Colors

Use neutrals to offset bright colors

- helps put together a composition
- can group in a more subtle way

Venngage.com
### Color Palettes

#### Rich & Polished
- #842F32
- #FF6747
- #E3E3CD
- #B7B992
- #49494D

#### Brilliant Blues
- #37AF99
- #2D8EB7
- #0C695D
- #0F2F22
- #152329

#### Baroque Luxury
- #A51E22
- #E8A631
- #E0C09B
- #E5E0DA
- #BFB8B3

#### Gracefully Modern
- #FAACT7
- #C9C9BD
- #F0EFEF
- #60686F
- #333C3E

#### Sunny & Warm
- #DA5226
- #F9893D
- #FEDC3B
- #D8C6B4
- #697768

#### Classic & Trustworthy
- #CA3542
- #276478
- #849FAD
- #E8C8C9
- #57575F
There are Templates on the Web
**Plotly** is a Python open source graphing library

- not as powerful as D3
- but does not require javascript programming
- not allowed for use in CSE 332, but OK for CSE 593 students