Importance of Context in Visualization

MIS561 Data Visualization

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Recap…

6 components in design principles

1. Understand the context
2. Choose an appropriate visual display
3. Eliminate clutter
4. Focus attention where you want it
5. Think like a designer
6. Tell a story

Lessons are not tool specific

Outline

- Exploratory vs. explanatory analysis
- Structuring stories
- Audience analysis for storytelling
  - who, what and how

Exploratory vs. explanatory analysis

Exploratory analysis

what you do to understand the data and figure out what might be noteworthy or interesting to highlight to others.

Our job as data analysts is to explore

Exploratory vs. explanatory analysis

Explanatory analysis

you have a specific thing you want to explain, a specific story you want to tell

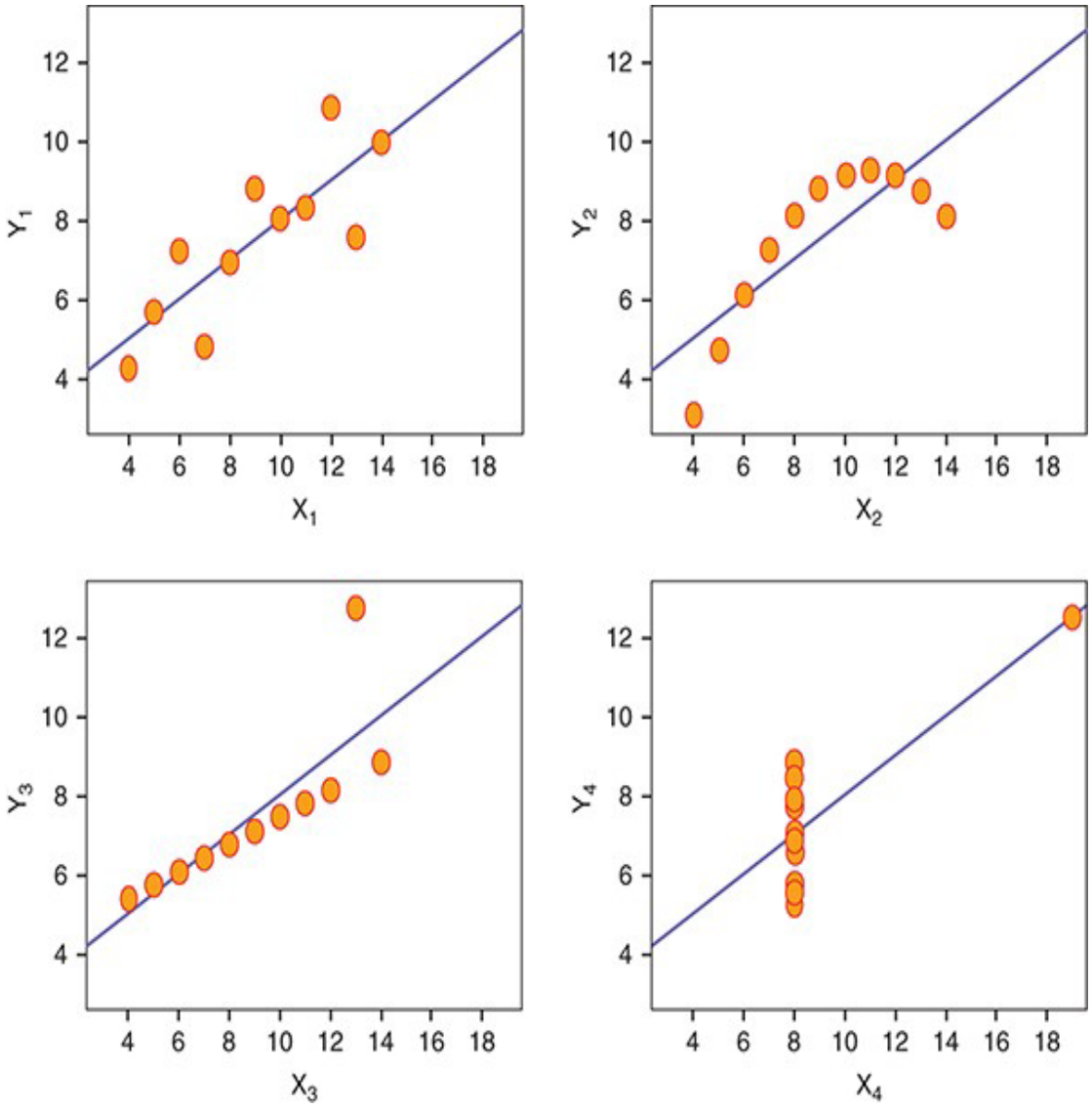
Our job as data storytellers is to explain

A classic example

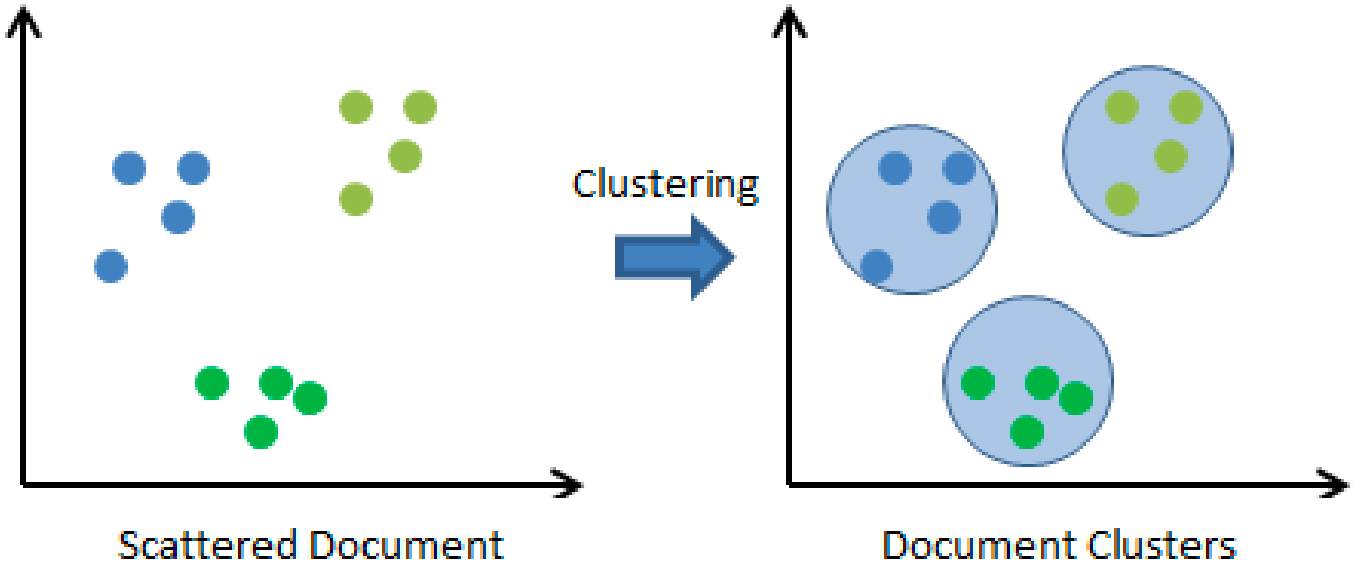
Four seemingly identical datasets in Anscombe's Quartet

	I		II		III		IV	
	X	Y	X	Y	X	Y	X	Y
	10	8.04	10	9.14	10	7.46	8	6.58
	8	6.95	8	8.14	8	6.77	8	5.76
	13	7.58	13	8.74	13	12.74	8	7.71
	9	8.81	9	8.77	9	7.11	8	8.84
	11	8.33	11	9.26	11	7.81	8	8.47
	14	9.96	14	8.1	14	8.84	8	7.04
	6	7.24	6	6.13	6	6.08	8	5.25
	4	4.26	4	3.1	4	5.38	10	12.5
	12	10.84	12	9.13	12	8.15	8	5.56
	7	4.82	7	7.26	7	6.42	8	7.91
	5	5.68	5	4.74	5	5.73	8	6.88
MEAN	9.00	7.5	9.00	7.5	9.00	7.5	9.00	7.5
STD	3.32	2.03	3.32	2.03	3.32	2.03	3.32	2.03
CORR	0.82		0.82		0.82		0.82	
LIN REG	y = 3.00 + 0.500x		y = 3.00 + 0.500x		y = 3.00 + 0.500x		y = 3.00 + 0.500x	

Anscombe's Quartet visualized



Another example

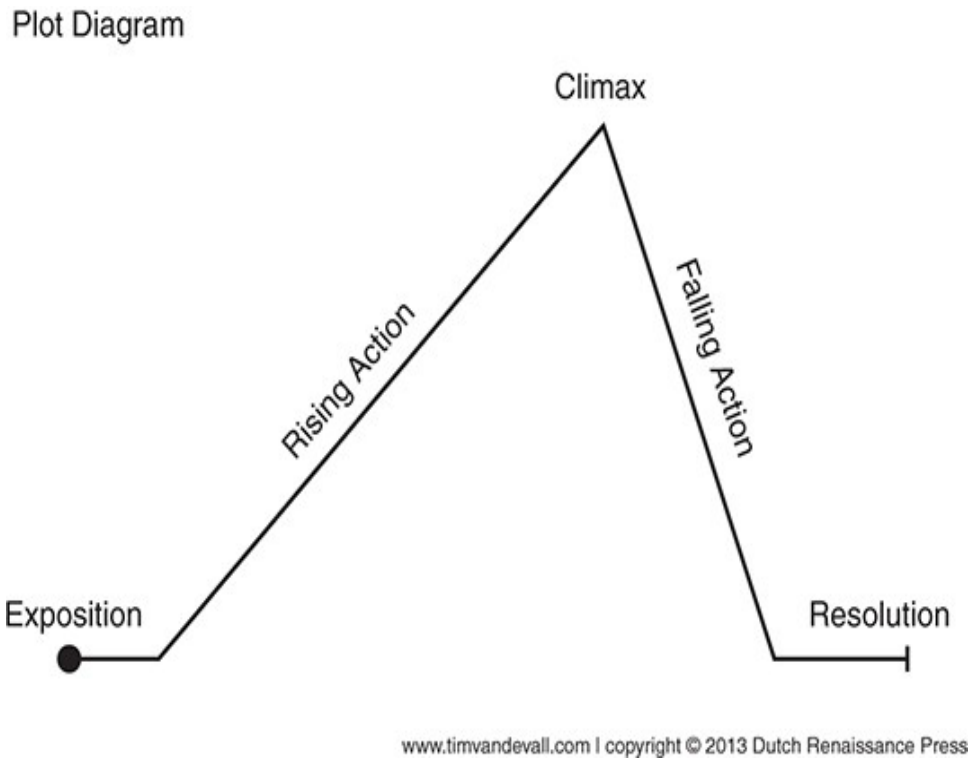


Story takeaway

Sometime the only way to see the story in a data is visually.

Structuring stories

Part one: story plot



The basic plot diagram

Structuring stories

Eight basic "plots" to help shape your visual data story

Change over time—See a visual history as told through a simple metric or trend

Drill down—Start big, and get more and more granular to find meaning

Zoom out—Reverse the particular, from the individual to a larger group

Contrast—The "this" or "that"

Spread—Help people see the light and the dark, or reach of data (disbursement)

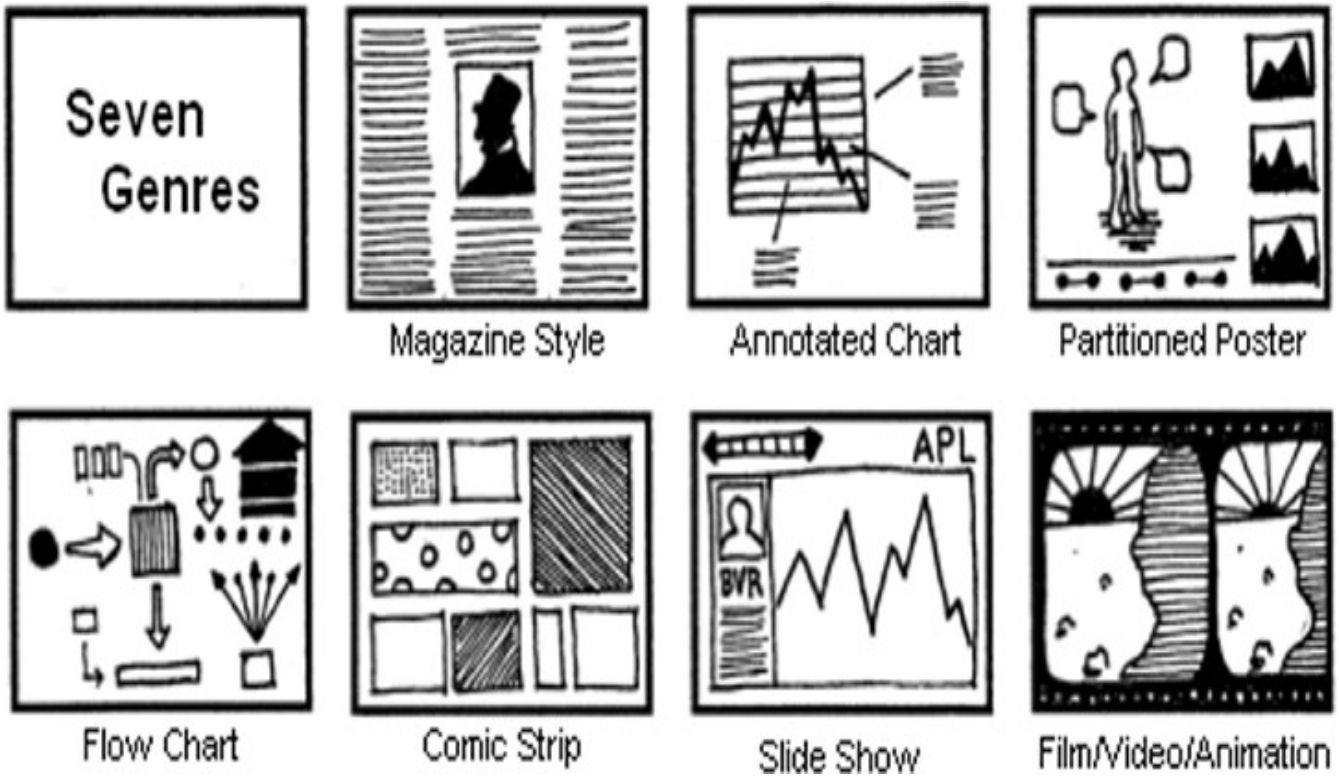
Intersections—Things that cross over, or progress ("less than" to "more than")

Factors—Things that work together to build up to a higher-level effect

Outliers—Powerful way to show something outside the realm of normal

Structuring stories

Part two: story genre



Structuring stories

Recommended reading

Segel E. and Heer J. (2010), Narrative visualization: Telling stories with data. *IEEE Transactions on Visualization and Computer Graphics, 16*(6), 1139–1148. https://doi.org/10.1109/TVCG.2010.179

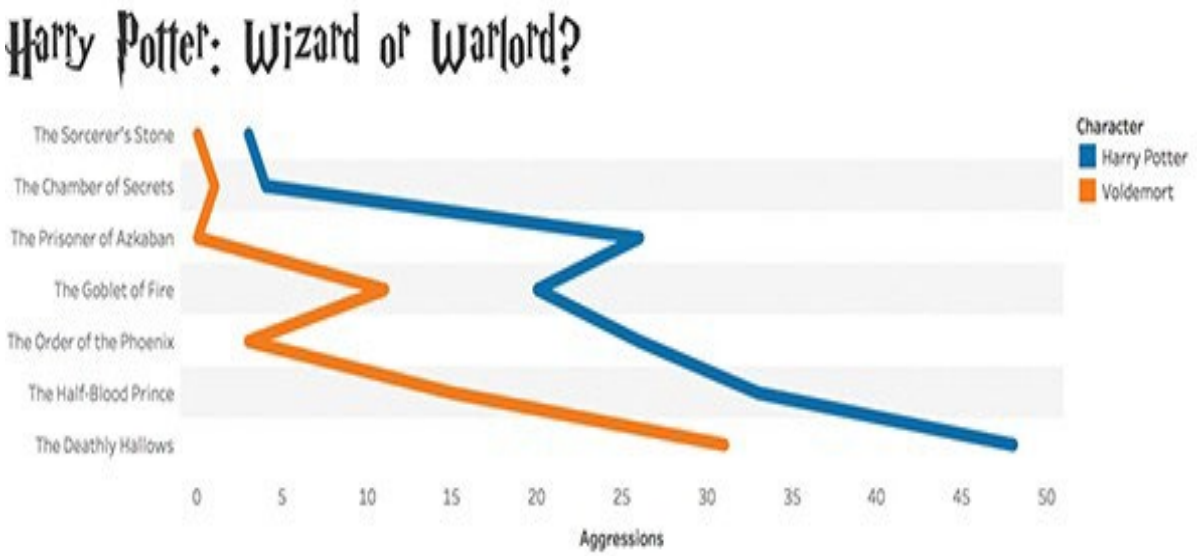
Context in action

To quote of football consulting company 21st Club

without context [in analytics] data is "meaningless, irrelevant, and even dangerous."

Without context we can't answer any of the pivotal journalistic questions—who, what, where, when, why, and how—that provide pertinent details to help us get to the bottom of any big question.

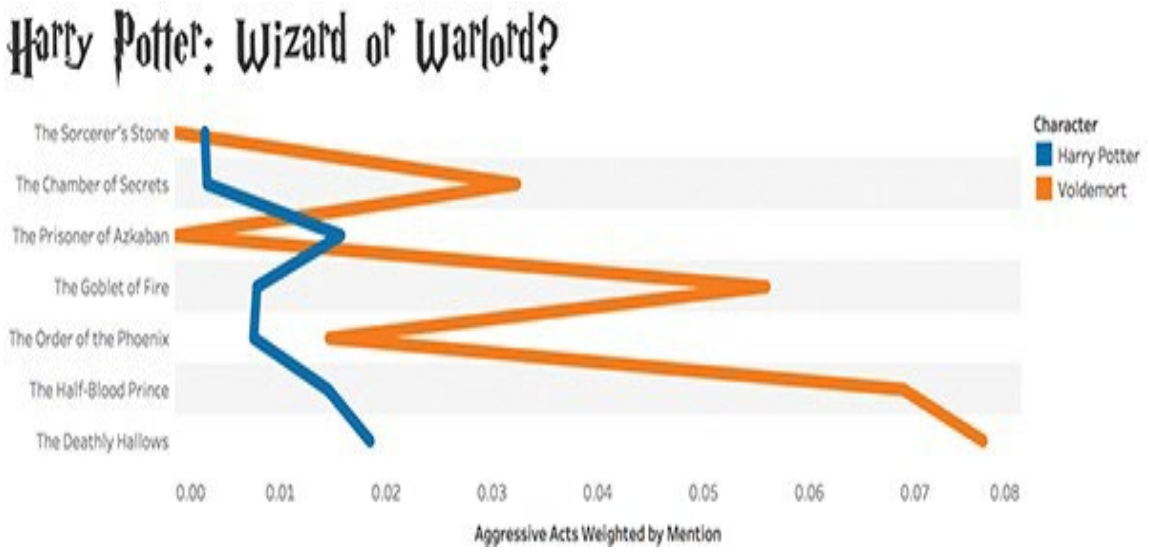
Harry Potter: Hero or Menace?



Aggressive actions committed by Harry Potter and Lord Voldemort.

Out of Context: How *many times* Harry and Voldemort acted aggressively.

Ensuring relevant context



With a little bit of context added back into the data, we see a different story

In Context: How *often* Harry and Voldemort acted aggressively *when mentioned*.

Audience analysis for storytelling

Who

Your audience

- The more specific you can be about who your audience is, the better position you will be in for successful communication.
- Avoid general audiences, such as "internal and external stakeholders" or "anyone who might be interested"
- Creating different communications for different audiences

You

- The relationship you have with your audience and how you expect that they will perceive you.

Audience analysis for storytelling

What *action*

- What do you need your audience to know or do?

  -> How to make what you communicate relevant for your audience?
- Audience knows much better than the presenter? -> false assumption
- Recommend an action explicitly

Audience analysis for storytelling

What *action*

Prompting action

Here are some action words to help act as thought starters as you determine what you are asking of your audience:

accept | agree | begin | believe | change | collaborate | commence | create | defend | desire | differentiate | do | empathize | empower | encourage | engage | establish | examine | facilitate | familiarize | form | implement | include | influence | invest | invigorate | know | learn | like | persuade | plan | promote | pursue | recommend | receive | remember | report | respond | secure | support | simplify | start | try | understand | validate

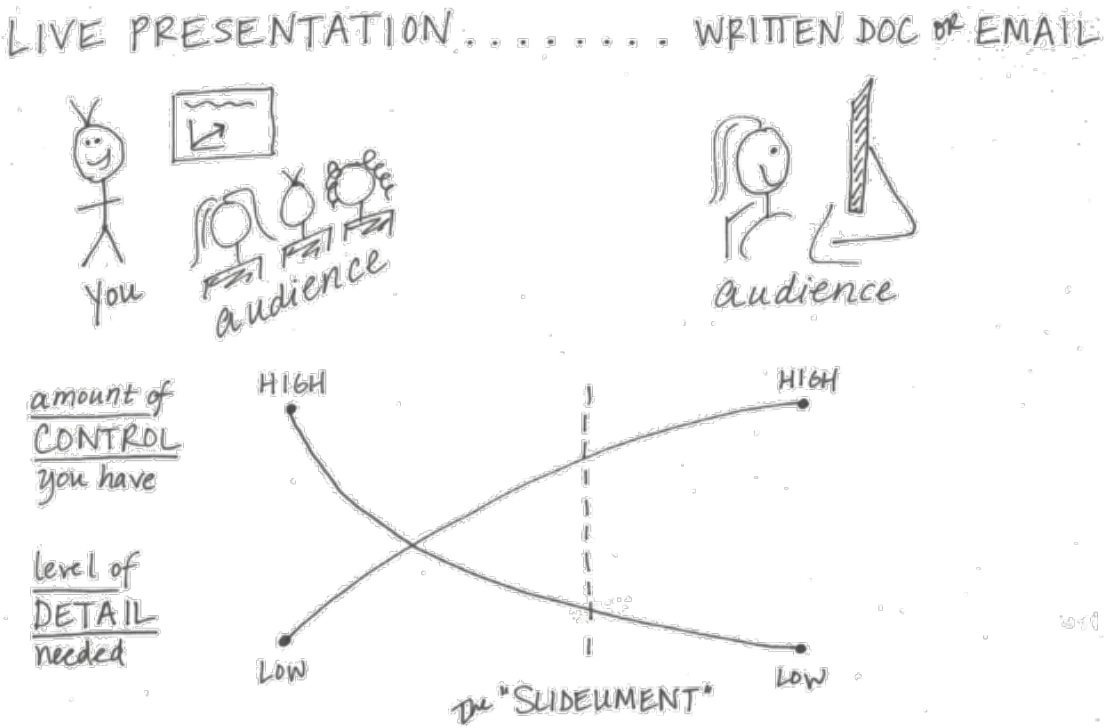
Audience analysis for storytelling

What *mechanism*

- How will you communicate to your audience?
  - the amount of control
  - level of detail

Audience analysis for storytelling

What *mechanism*



communication mechanism continuum

-live presentation -slideument -written document/email

Audience analysis for storytelling

What *tone*

- What tone do you want your communication to set?
  - Are you celebrating a success?
  - Trying to light a fire to drive action?
  - Is the topic lighthearted or serious?
- The tone you desire for your communication will have implications on the design choices

Audience analysis for storytelling

How

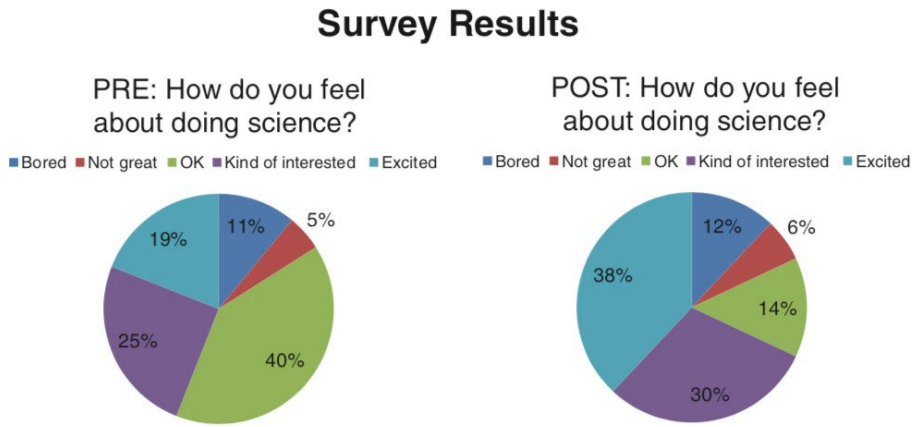
- What data is available that will help make your point?

Ignore the nonsupporting data?

You might assume that showing only the data that backs up your point and ignoring the rest will make for a stronger case. I do not recommend this. Beyond being misleading by painting a one-sided story, this is very risky. A discerning audience will poke holes in a story that doesn't hold up or data that shows one aspect but ignores the rest. The right amount of context and supporting and opposing data will vary depending on the situation, the level of trust you have with your audience, and other factors.

Who, what and how: an example

Imagine you are a fourth grade science teacher. You just wrapped up an experimental pilot summer learning program on science that was aimed at giving kids exposure to the unpopular subject. You surveyed the children at the onset and end of the program to understand whether and how perceptions toward science changed. You believe the data shows a great success story. You would like to continue to offer the summer learning program on science going forward.



Who, what and how: an example

Who?

- parents of student participants
- future potential participants
- other teachers who might be interested in doing something similar
- budget committee that controls the fund for this program

What?

- The call to action would be different for different audiences

How?

Who, what and how: an example

Let's assume in this case –

Who: The budget committee that can approve funding for continuation of the summer learning program.

What: The summer learning program on science was a success; please approve budget of $X to continue.

How: Illustrate success with data collected through the survey conducted before and after the pilot program.

Consulting for context

- What background information is relevant or essential?
- Who is the audience or decision maker? What do we know about them?
- What biases does our audience have that might make them supportive of or resistant to our message?
- What data is available that would strengthen our case? Is our audience familiar with this data, or is it new?
- Where are the risks: what factors could weaken our case and do we need to proactively address them?
- What would a successful outcome look like?
- If you only had a limited amount of time or a single sentence to tell your audience what they need to know, what would you say?

3-minute Story & Big Idea

3-minute Story

The 3-minute story is exactly that: if you had only three minutes to tell your audience what they need to know, what would you say?

This is a great way to ensure you are clear on and can articulate the story you want to tell.

3-minute Story & Big Idea

Big Idea

The Big Idea boils the so-what down even further: to a single sentence. This is a concept that Nancy Duarte discusses in her book, *Resonate* (2010).

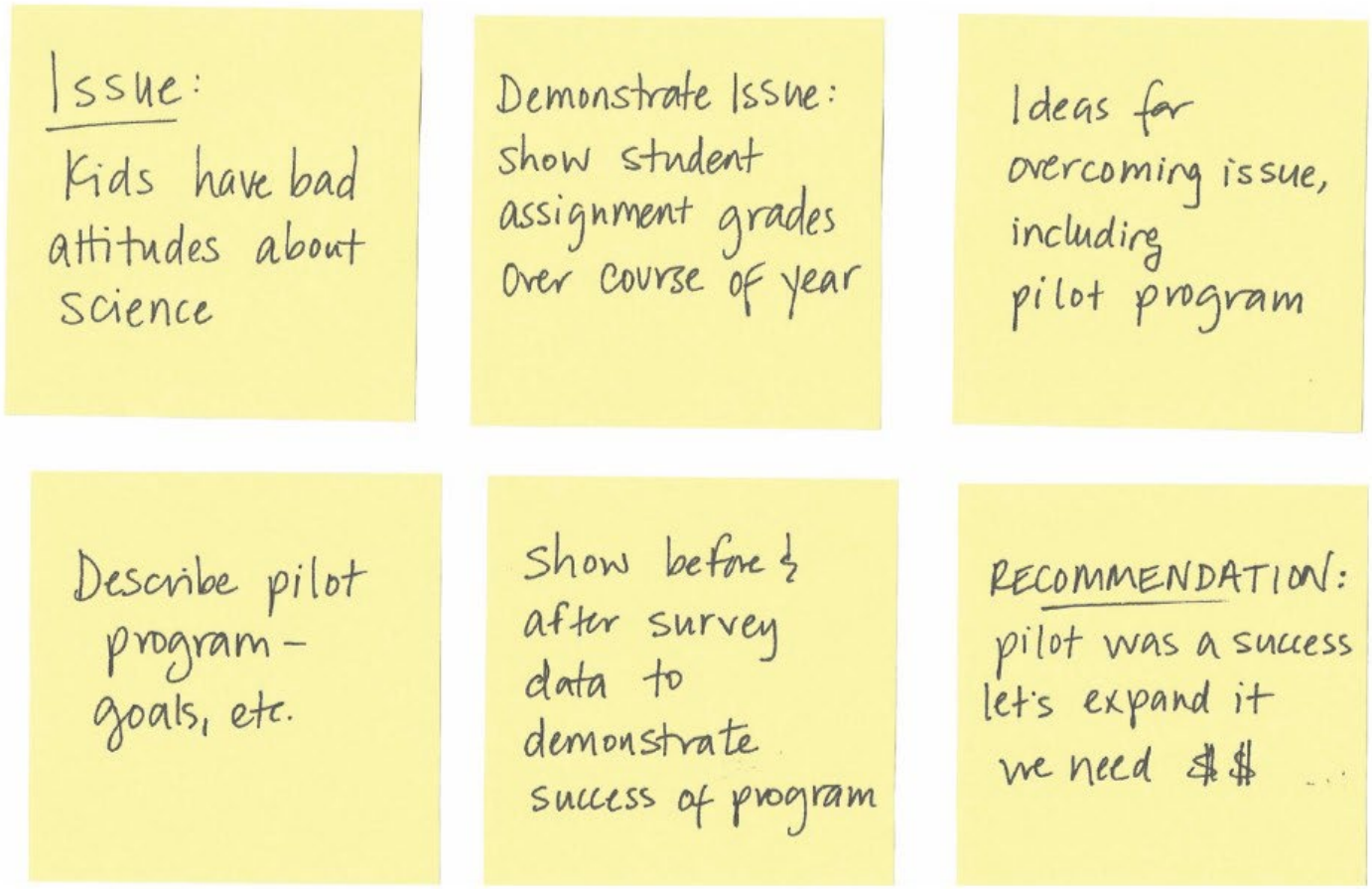
Duarte (2010) introduces three components of Big Idea :

- It must articulate your unique point of view
- It must convey what's at stake;
- It must be a complete sentence

3-minute story: *A group of us in the science department were brainstorming about how to resolve an ongoing issue we have with incoming fourth-graders. It seems that when kids get to their first science class, they come in with this attitude that it's going to be difficult and they aren't going to like it. It takes a good amount of time at the beginning of the school year to get beyond that. So we thought, what if we try to give kids exposure to science sooner? Can we influence their perception? We piloted a learning program last summer aimed at doing just that. We invited elementary school students and ended up with a large group of second- and third-graders. Our goal was to give them earlier exposure to science in hopes of forming positive perception. To test whether we were successful, we surveyed the students before and after the program. We found that, going into the program, the biggest segment of students, 40%, felt just "OK" about science, whereas after the program, most of these shifted into positive perceptions, with nearly 70% of total students expressing some level of interest toward science. We feel that this demonstrates the success of the program and that we should not only continue to offer it, but also to expand our reach with it going forward.*

Big Idea: *The pilot summer learning program was successful at improving students' perceptions of science and, because of this success, we recommend continuing to offer it going forward; please approve our budget for this program.*

Storyboarding



Example storyboard

the importance of context

Source: https://rb.gy/q8zu8t

Business Analytics Academic Programs in the US

Data source: data_science_colleges.csv

Description

A list of colleges and universities offering degrees in data science.The actual list of schools, the list is sorted by COUNTRY (descending) then STATE then SCHOOL.

Your task

1. Comprehend the data.
2. If you will present to Ministry of Education on "how big data science education is" – i.e., the status of business analytics program offerings – in the country. Discuss the context of this visualization.
3. Try to create the visualization in Tableau.