

Welcome to...

REPORTS, TABLES & CHARTS

OH MY! Data visualization for any skill level

with Amanda Johnson

Download the handout

<http://bit.ly/4nOfzJL>



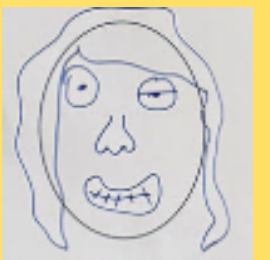
Download the slides

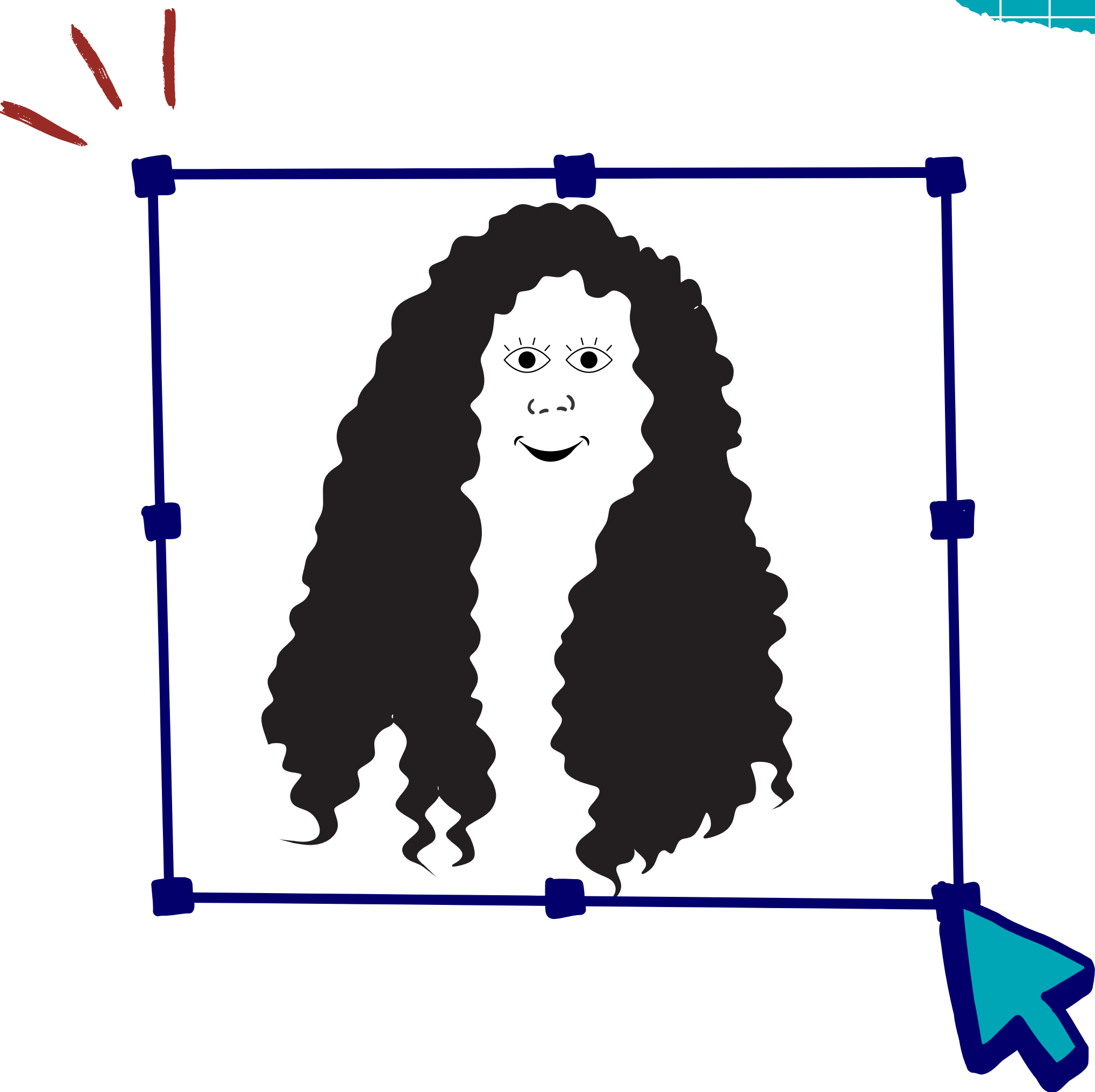
<https://bit.ly/495aBDY>



CHERNOFF FACE

While we wait to get started, follow the instructions on your handout to make a Chernoff Face visualization and share with a neighbor.





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Data Analysis & Communication Consultant





AGENDA

Why visualize data

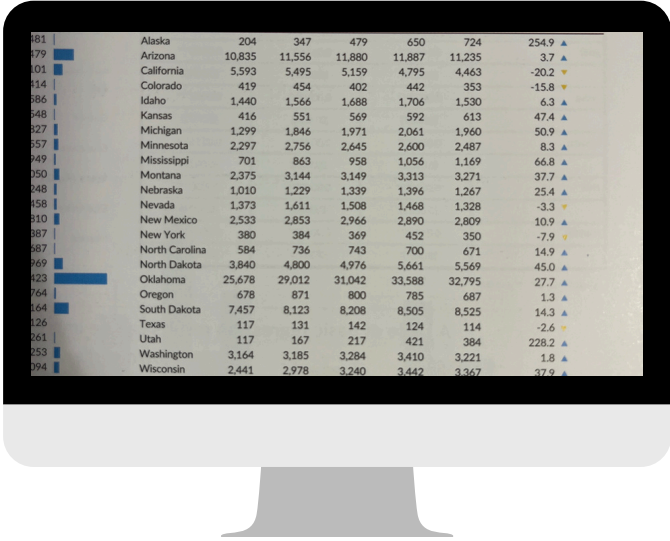
5 best practices

Practice makes progress

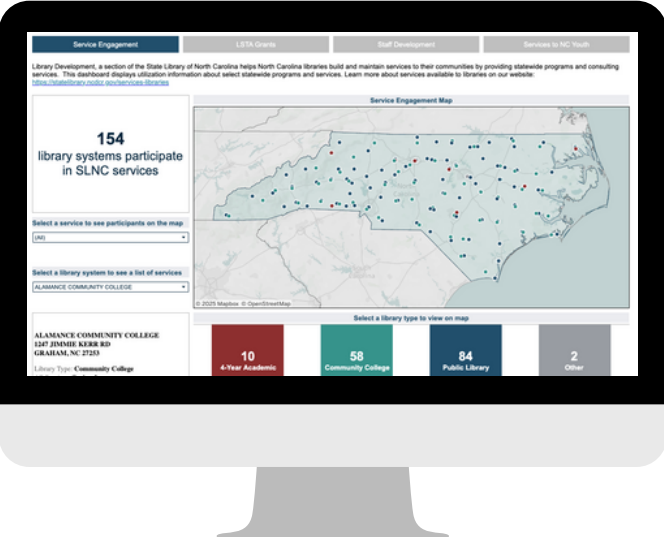
1 Page Report

DATA VISUALIZATION IS A CONTINUUM

TABLES



DASHBOARDS



REASONS TO VISUALIZE



REASONS TO VISUALIZE

TO GRAB ATTENTION



REASONS TO VISUALIZE

TO SEE PATTERNS & MAKE MEANING

1		2		3		4	
x	y	x	y	x	y	x	y
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89

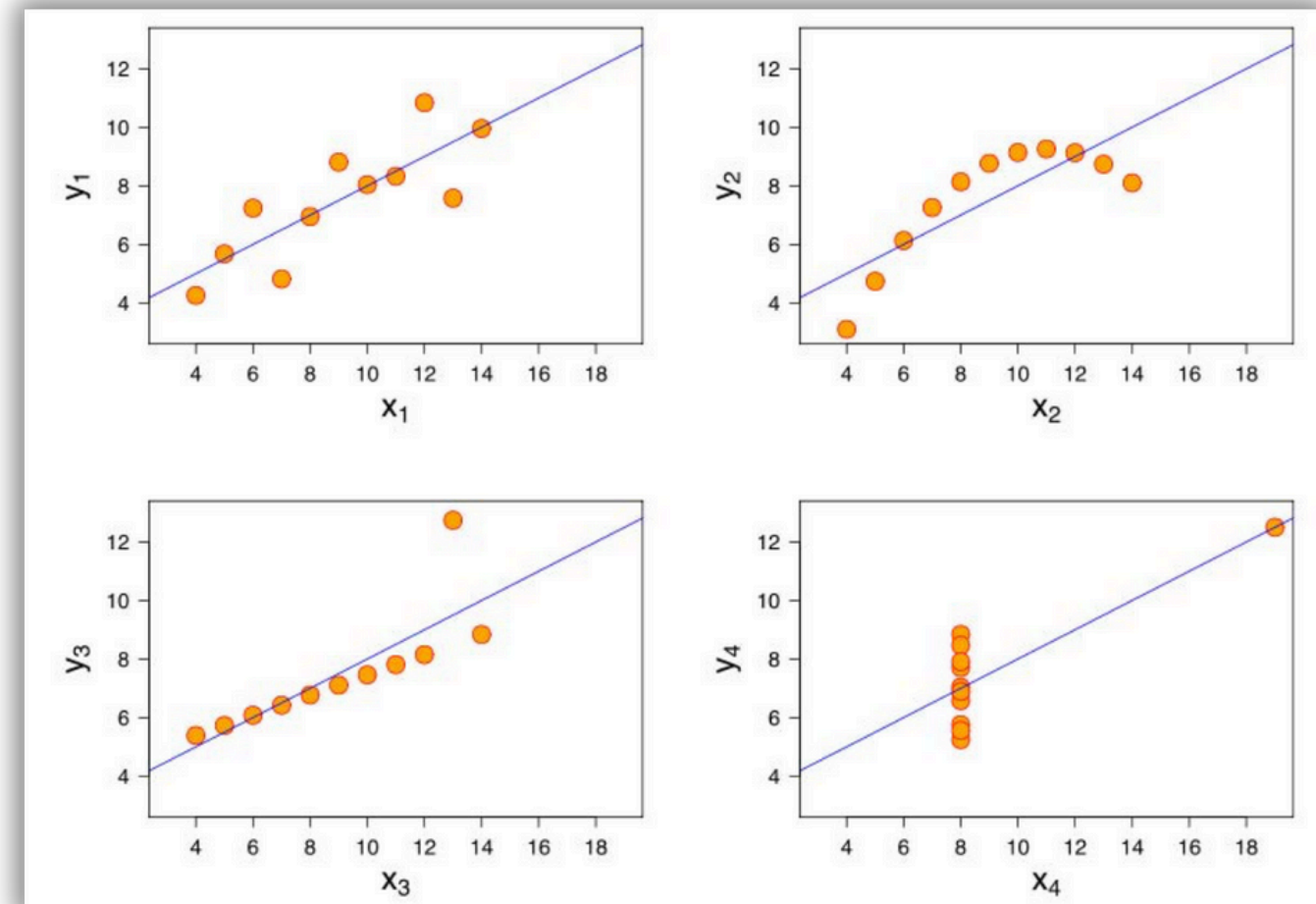
*Almost identical
summary statistics:*

x & y mean

x & y variance

x-y correlation

x-y linear regression



DATA VISUALIZATION BEST PRACTICES

1

**CHOOSE THE RIGHT
VISUALIZATION**

2

**HAVE A MESSAGE &
REINFORCE IT**

3

**GIVE CONTEXT TO
DATA**

4

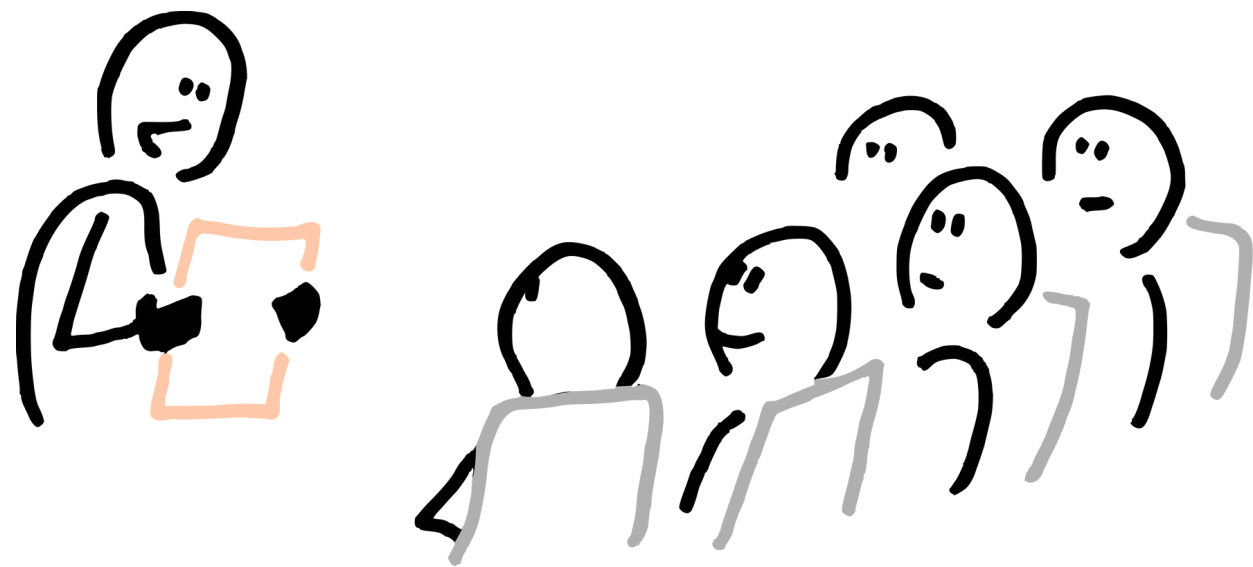
**PAY ATTENTION TO
ARRANGEMENT**

5

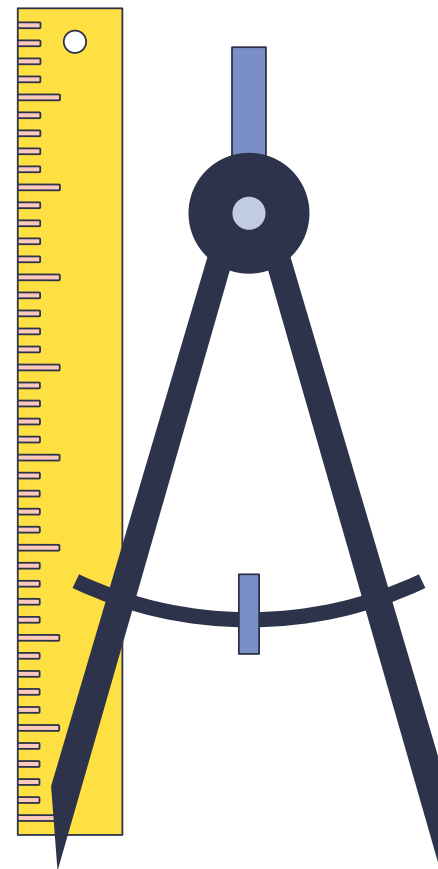
KEEP IT SIMPLE

BEST PRACTICE

1 CHOOSE THE RIGHT VISUALIZATION



Audience



Tools



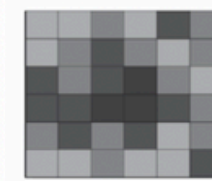
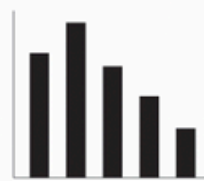
Time

1. CHOOSE THE RIGHT VISUALIZATION

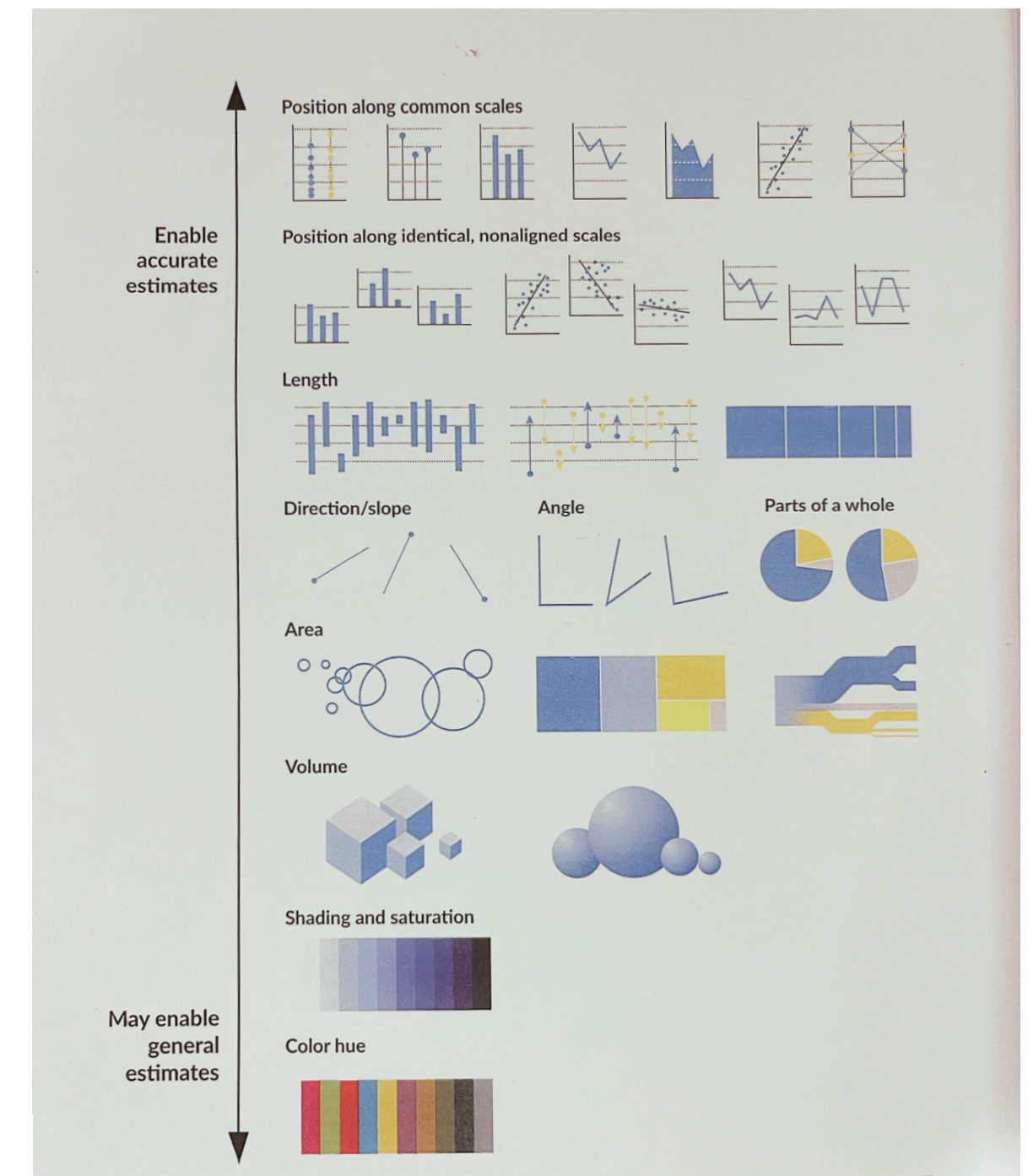
CHARTS

Good charts for broad audiences

- Bar chart
- Pie chart
- Line chart
- Scatterplot
- Highlight table/
heatmap

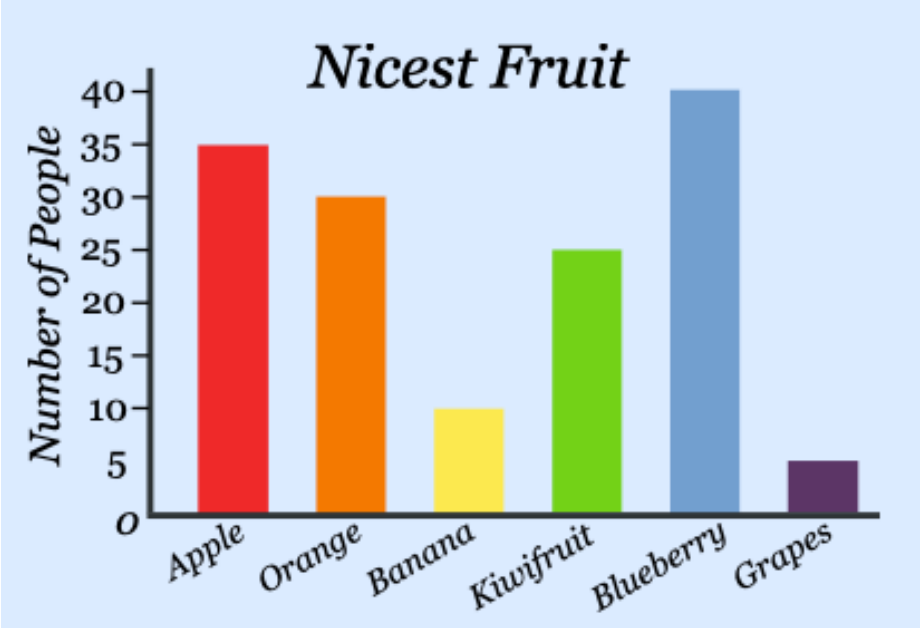


Zoss, Angela M. "Designing Public Visualizations of Library Data." In *Data Visualization: A Guide to Visual Storytelling for Librarians*, edited by Lauren Magnuson. Lanham, MD: Rowman & Littlefield Publishers, Inc., 2016. Preprint: <https://dx.doi.org/10.6084/m9.figshare.3811713.v1>

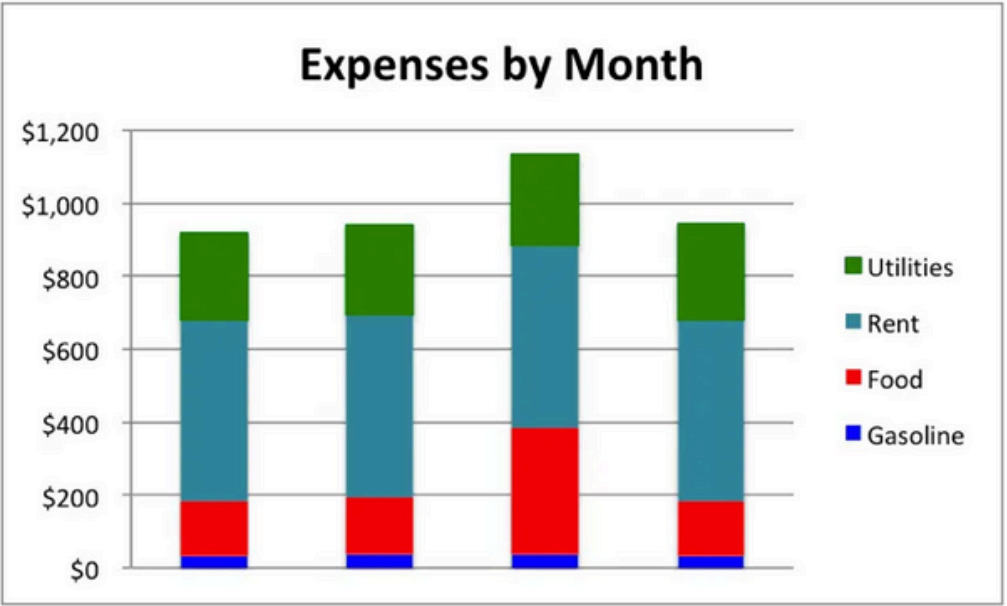


1. CHOOSE THE RIGHT VISUALIZATION

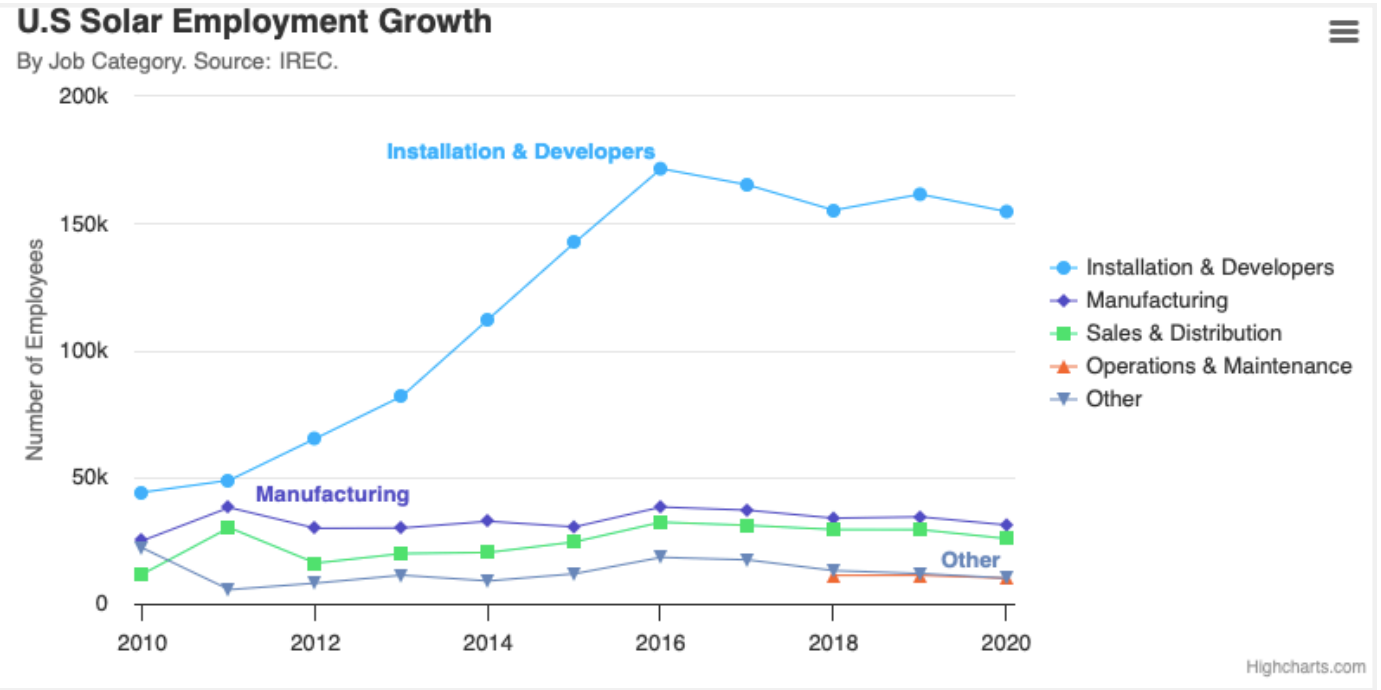
CHARTS



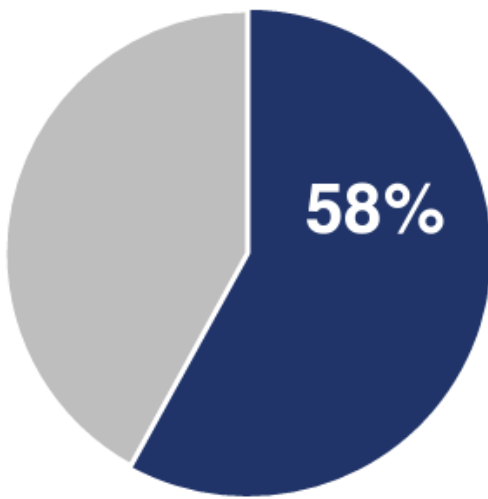
[source](#)



[Source](#)



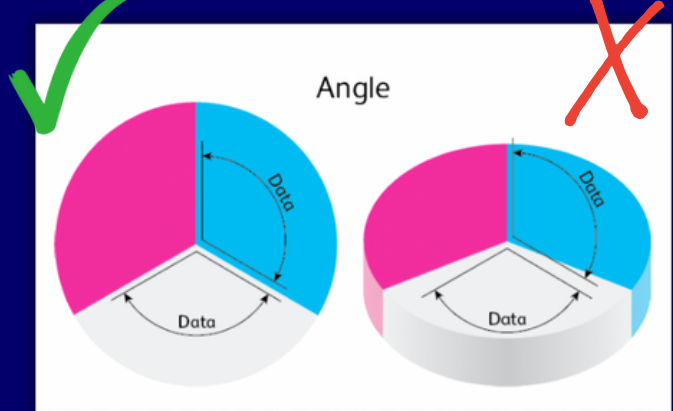
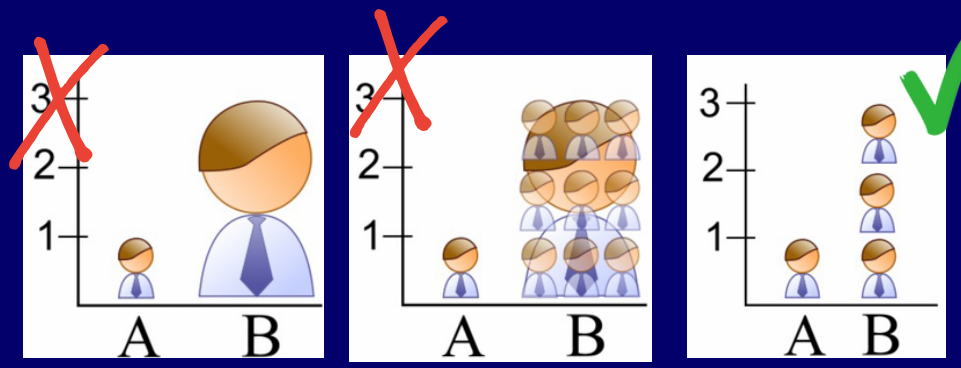
Federal law requires schools to have a transition plan for every special education student exiting high school.



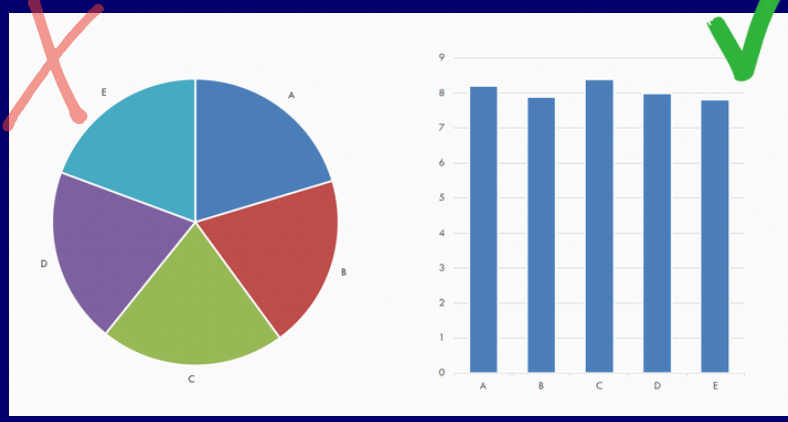
of youth with autism had a transition plan by the required age according to their teachers.

WATCH OUT FOR

...distortion



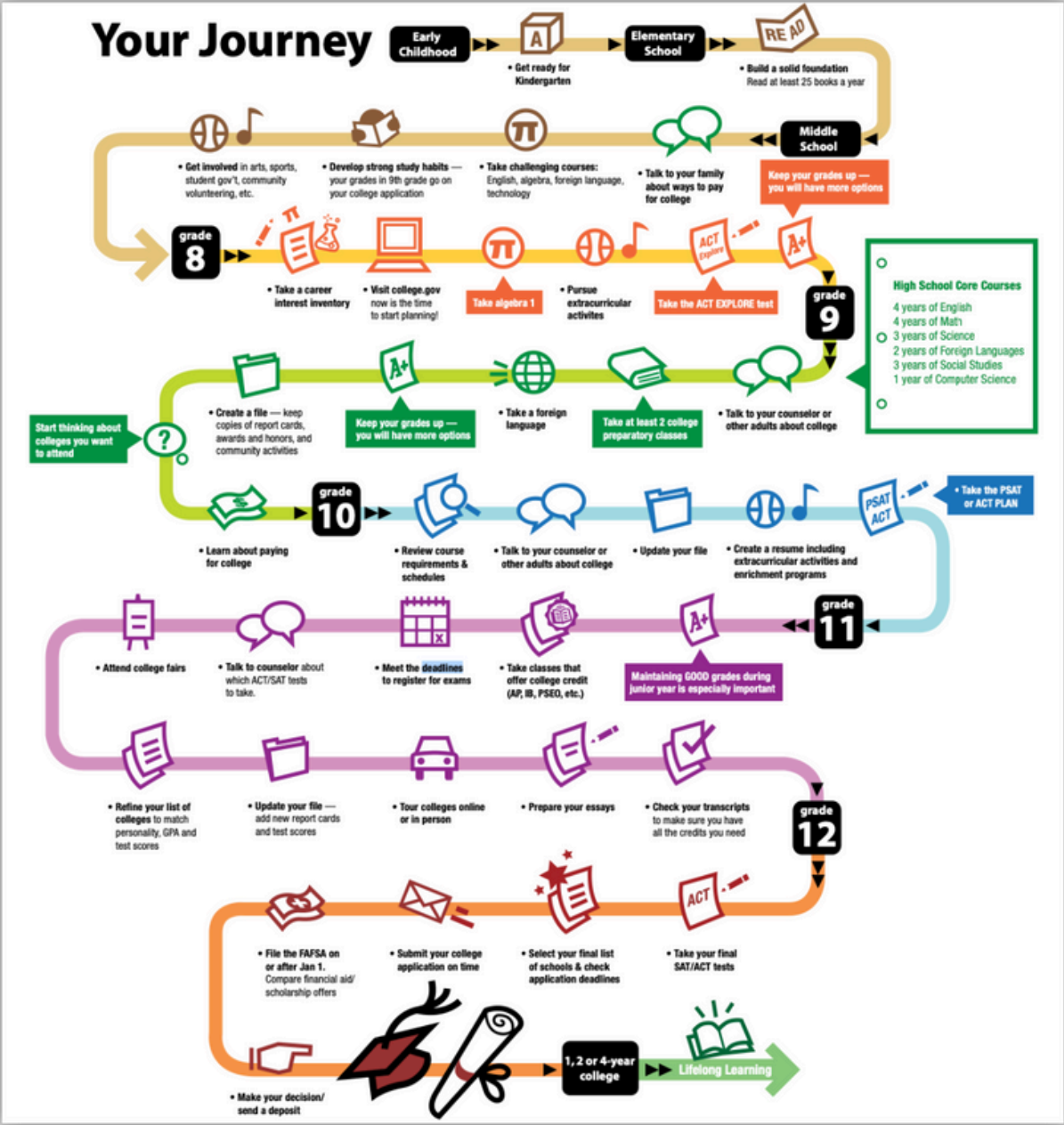
...and perception



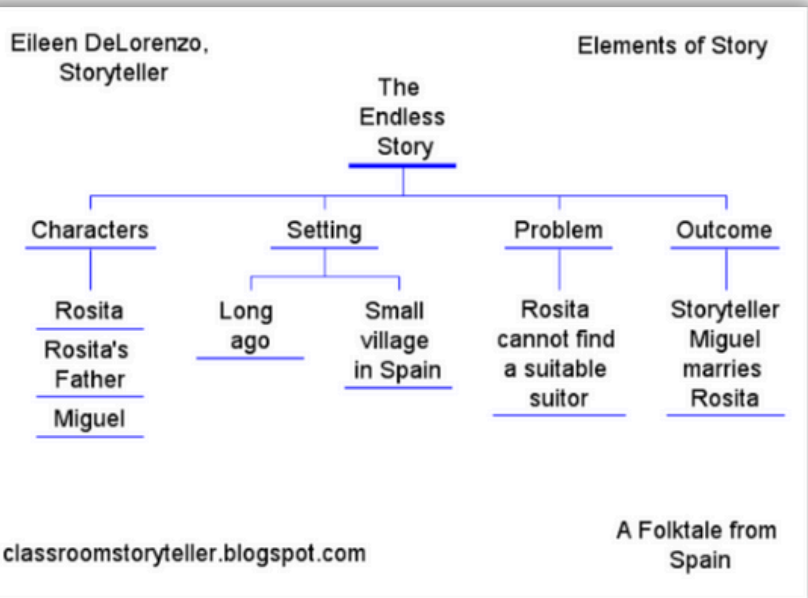
1. CHOOSE THE RIGHT VISUALIZATION

DIAGRAMS

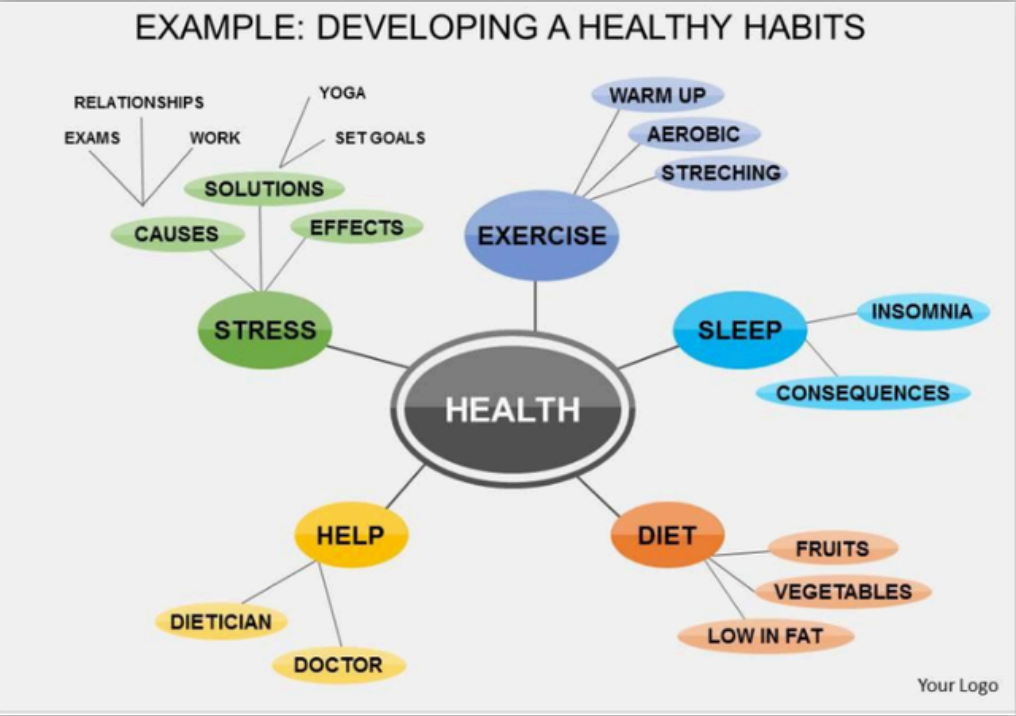
Journey Map: visualize a process



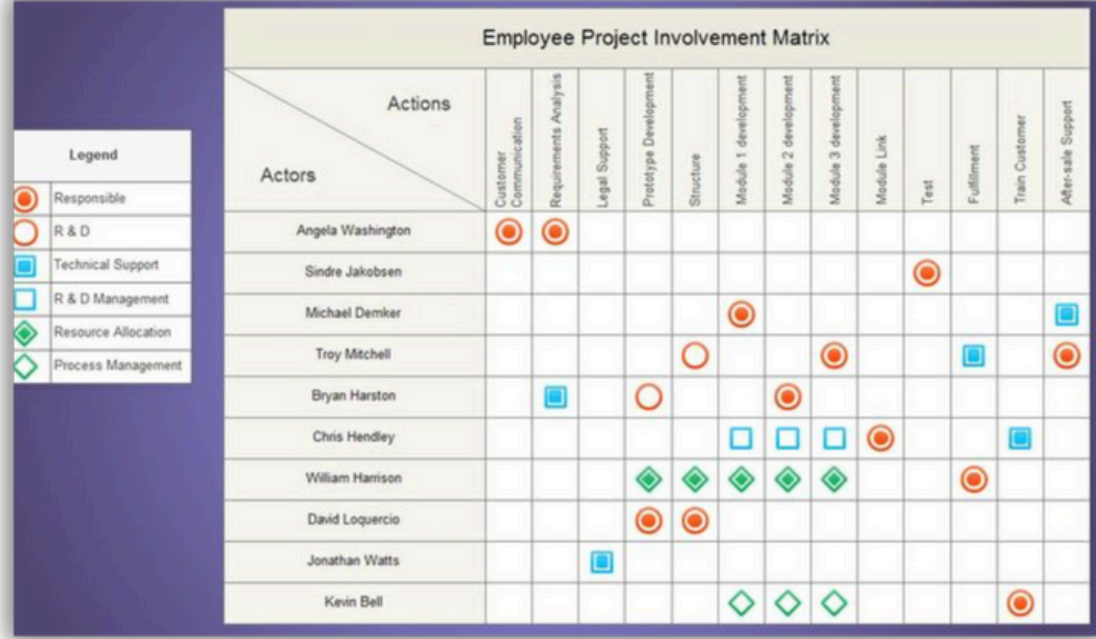
Tree map: how parts relate to a whole



Mind map: break down a complex topic



Matrix: insection of categories



1. CHOOSE THE RIGHT VISUALIZATION

TABLES

TABLE TIPS:

1. Offset the header from the body
2. Use subtle dividers
3. Right-align numbers and column headers
4. Left align text values
5. Choose the appropriate level of precision
6. Guide the reader with spacing
7. Highlight outliers or important data
8. Introduce visualization

Number of People Participating in Food Distribution Programs on Indian Reservations

(Data as of March 9, 2018)

State	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	Percent Change
						FY 2013-FY 2017
Alaska	204	347	479	650	724	254.9 ▲
Arizona	10,835	11,556	11,880	11,887	11,235	3.7 ▲
California	5,593	5,495	5,159	4,795	4,463	-20.2 ▼
Colorado	419	454	402	442	353	-15.8 ▼
Idaho	1,440	1,566	1,688	1,706	1,530	6.3 ▲
Kansas	416	551	569	592	613	47.4 ▲
Michigan	1,299	1,846	1,971	2,061	1,960	50.9 ▲
Minnesota	2,297	2,756	2,645	2,600	2,487	8.3 ▲
Mississippi	701	863	958	1,056	1,169	66.8 ▲
Montana	2,375	3,144	3,149	3,313	3,271	37.7 ▲
Nebraska	1,010	1,229	1,339	1,396	1,267	25.4 ▲
Nevada	1,373	1,611	1,508	1,468	1,328	-3.3 ▼
New Mexico	2,533	2,853	2,966	2,890	2,809	10.9 ▲
New York	380	384	369	452	350	-7.9 ▼
North Carolina	584	736	743	700	671	14.9 ▲
North Dakota	3,840	4,800	4,976	5,661	5,569	45.0 ▲
Oklahoma	25,678	29,012	31,042	33,588	32,795	27.7 ▲
Oregon	678	871	800	785	687	1.3 ▲
South Dakota	7,457	8,123	8,208	8,505	8,525	14.3 ▲
Texas	117	131	142	124	114	-2.6 ▼
Utah	117	167	217	421	384	228.2 ▲
Washington	3,164	3,185	3,284	3,410	3,221	1.8 ▲
Wisconsin	2,441	2,978	3,240	3,442	3,367	37.9 ▲
Wyoming	657	742	881	1,096	1,190	81.1 ▲
Total	75,608	85,397	88,615	93,038	90,083	19.1

Note: FDPIR is an alternative to the Supplemental Nutrition Assistance Program for Indian tribal organizations which prefer food distribution. Participation numbers are 12-month average. Data are subject to revision.

1. CHOOSE THE RIGHT VISUALIZATION

TABLES

Old Style vs. Lining Fonts

124.17 680.90 FP DANCER	124.17 680.90 GEORGIA
124.17 680.90 WORK SANS	124.17 680.90 GARAMOND

NOT IDEAL: OLDSTYLE

BETTER: LINING

Proportional vs. Tabular

124.17 680.90 WORK SANS	124.17 680.90 INTER
124.17 680.90 ROBOTO	124.17 680.90 SOURCE SANS PRO

NOT IDEAL: PROPORTIONAL

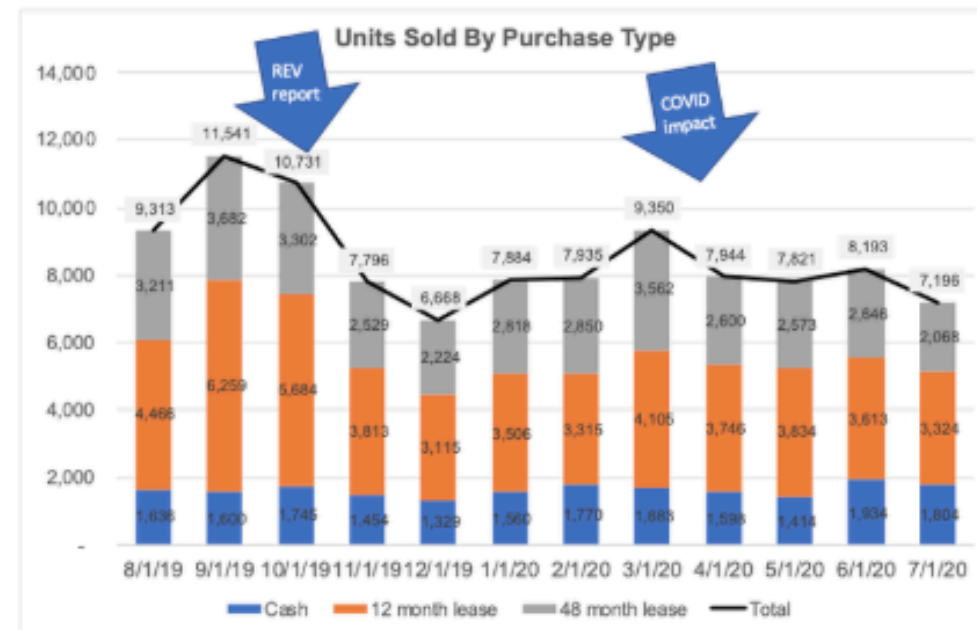
BETTER: TABULAR

[Source](#)

BEST PRACTICE

2 HAVE A MESSAGE & REINFORCE IT

BEFORE: SHOWING DATA



AFTER: STORYTELLING WITH DATA

Consumer behavior has shifted

Total units sold is **down 22.7% YoY** and down 23% since **the impact of COVID lockdowns** in the US.

The COVID impact caused a sharp decrease in the number of units sold as of July. We expect this decline to level out by each year-end due to discussions with key customers about resuming their purchasing cycles.

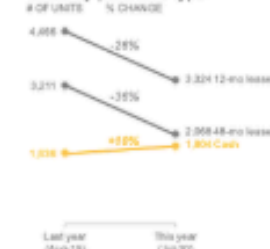
Total sales over time



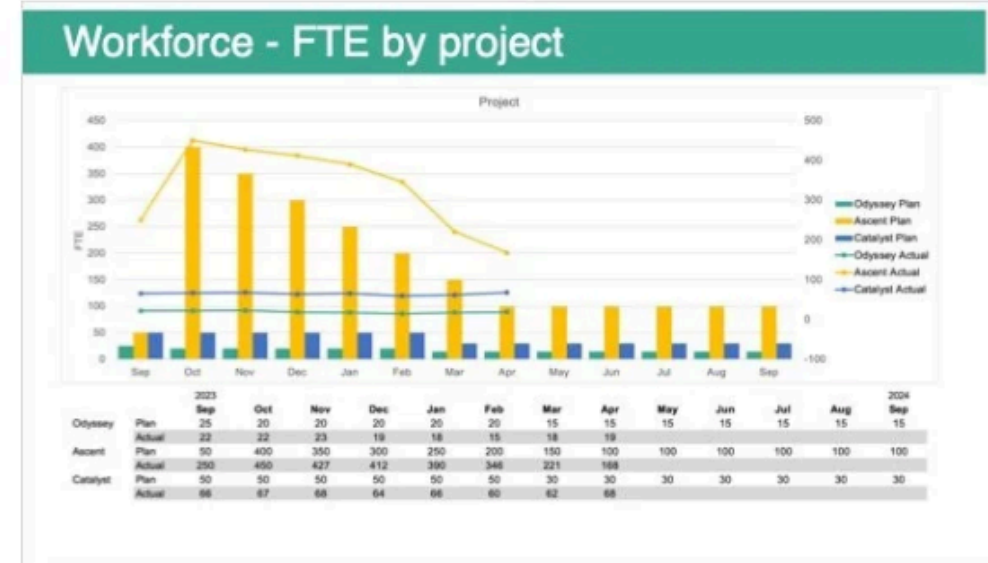
Purchase type composition has evolved over time. How might this impact our go-forward strategy?

As a result of the market and access to financing, the 12 and 48 month leases are decreasing in utilization. **Cash purchases have increased 10% in the last 12 months.** We expect this to continue.

Sales by purchase type



BEFORE: SHOWING DATA



AFTER: STORYTELLING WITH DATA

More funding needed to complete projects on time

ACTUAL RESOURCES HIGHER THAN PLAN

The total workforce allocation is **1,026 FTE above the expected plan** as of the end of April 2024. The actual FTEs are 44% higher than expected, and an average is expected to continue for the remainder of the year.

Workforce: actual versus plan by month

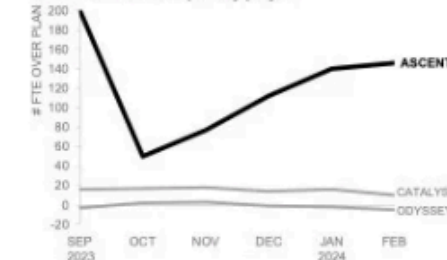


Approve funding to cover the cost of additional resources and ensure projects are completed on time.

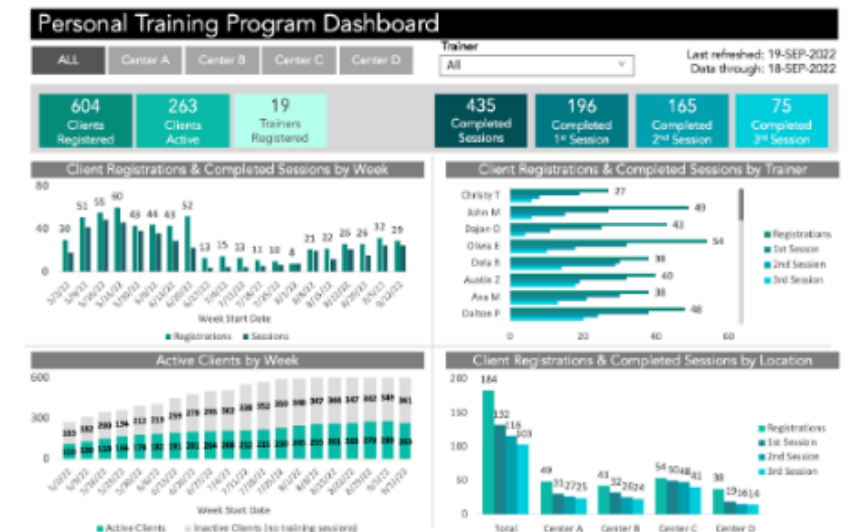
ASCENT PROJECT CAUSING 84% OF OVERRUN

Most projects were close to plan expectations (within 20 FTE of the monthly estimate). However, the **Ascent project is markedly over plan** due to a major scope change requiring additional workforce support.

Number of FTE over plan by project



BEFORE: SHOWING DATA



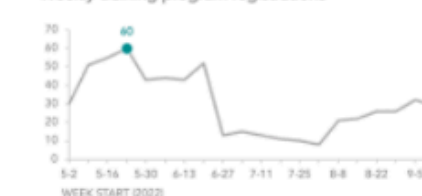
AFTER: STORYTELLING WITH DATA

Opportunity: expand our training program

Our summer promotion was effective at getting clients to register for the program, but our latest weekly training program **registrations are 50% lower** compared to the highest week in May.

RECOMMENDATION: Review current awareness and promotion strategies to drive additional registrations.

Weekly training program registrations



The volume of training sessions attended has also tapered off since May. **Center C has the highest percentage of registrations** participating in personal training sessions.

LET'S DISCUSS: What can we learn from **Center C's** success with program engagement?

Session engagement level by center

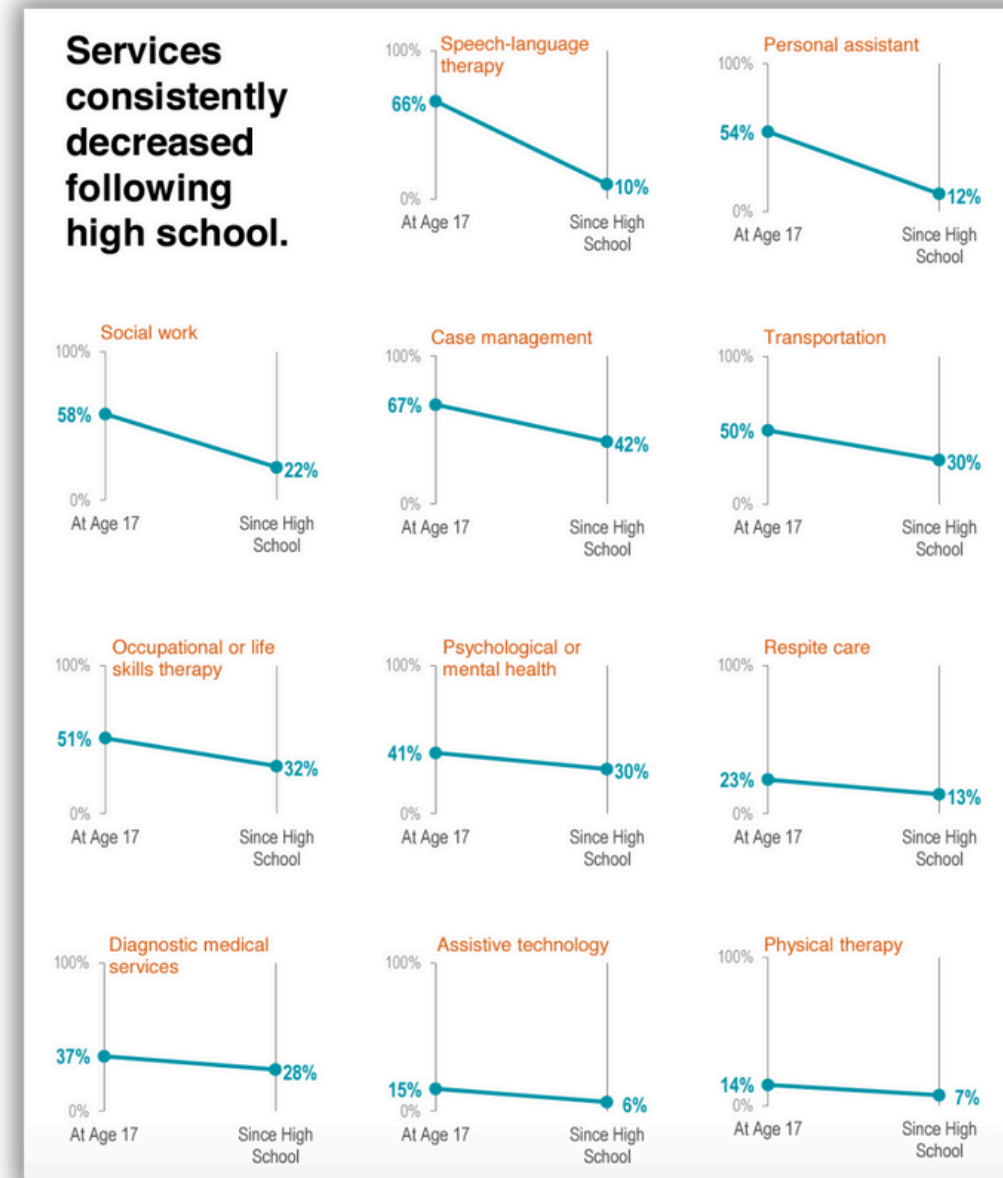


Source

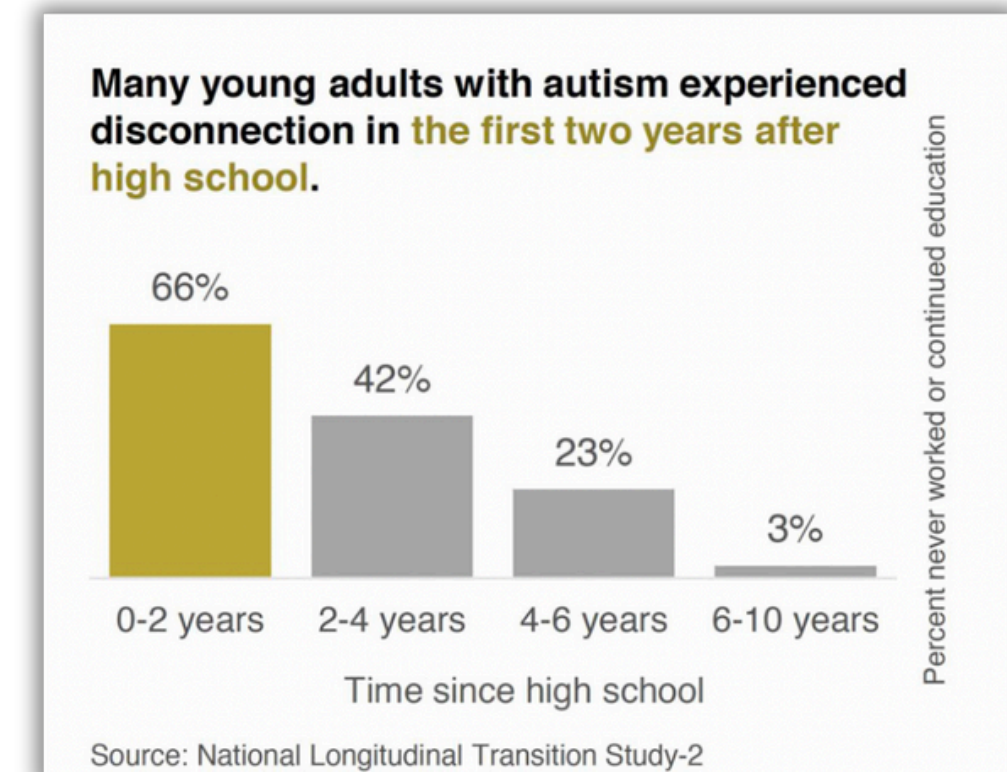
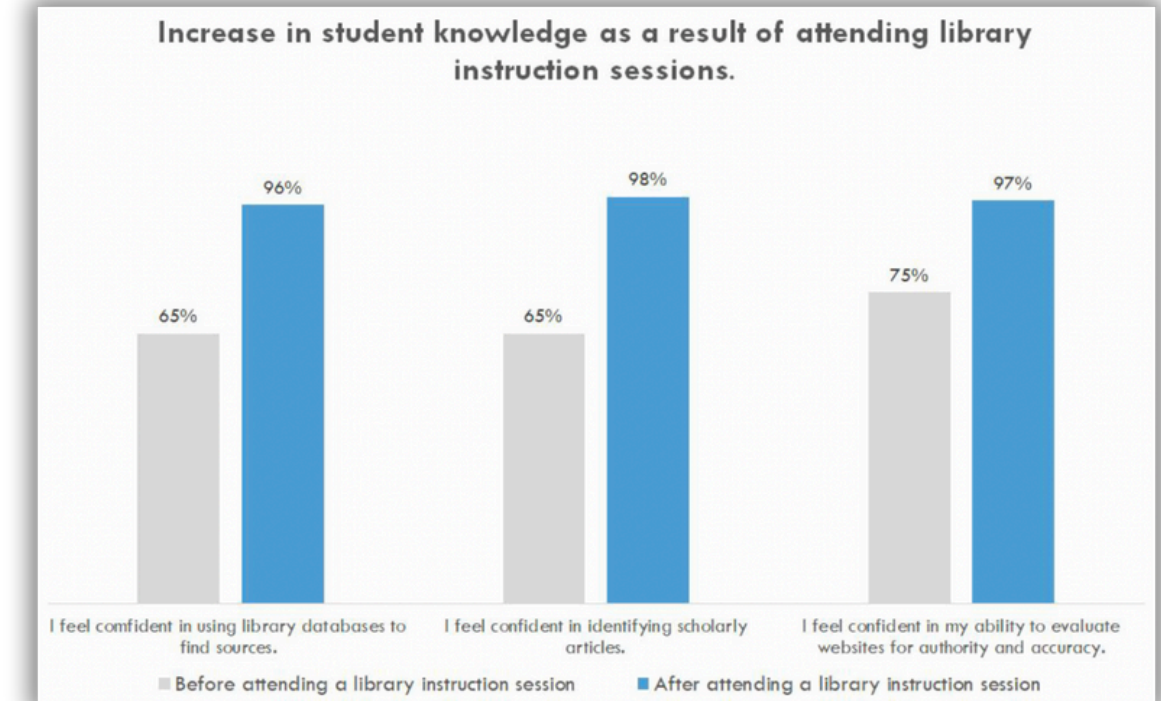
2. HAVE A MESSAGE & REINFORCE IT

CLEARLY STATE THE POINT

- Make titles statements that call out trends
- Make descriptive observations or short statements that frame the chart. Describe why the data is important.
- Emphasize important data or trends through data labels, annotations, or other visual markers



Source



2. HAVE A MESSAGE & REINFORCE IT

A DATA STORY IN 3 ACTS

ACT 1: BEGINNING

The beginning of the story needs to make the current situation clear.

The library has had stable state and federal funding for the past several years allowing it to offer a consistent and growing list of services.

ACT 2: MESSY MIDDLE*

The middle reveals the main conflict. Data is presented that shows a problem or opportunity.

Due to a change in administration and shifting priorities, federal funding may be reduced or eliminated representing a 35% gap in income.

ACT 3: END

The end is your opportunity to provide recommendations and your perspective on possible ways forward.

We need to evaluate our service offerings for efficiencies in service management and delivery along with assessing customer perceptions of value and need to identify potential cost-saving measures.

***BE CLEAR ABOUT WHAT ACTION IS NEEDED**

CHANGE

We need to change what we are doing. Denotes a transformation is needed.

CONTINUE

We need to keep going in the same direction. We are on track and its full steam ahead.

FINISH

We need to stop, move on or complete this. Finishing can be about meeting a goal or calling it quits.

2. HAVE A MESSAGE & REINFORCE IT

VERBS

CHANGE VERBS

PERFORMANCE

Accelerate
Acquire
Add
Advance
Allocate
Balance
Block
Buy
Capture
Centralize
Compete
Compress
Consume
Control
Convert
Decentralize
Decrease
Deliver
Design
Disrupt
Divest

PROCESS

Enlarge
Enter
Exceed
Expand
Extend
Gain
Grow
Impact
Improve
Increase
Invest
Lessen
Maximize
Minimize
Outperform
Prevent
Recover
Reduce
Restore
Save
Scale
Shift
Spend
Stabilize
Train

PROCESS

Accept
Address
Adopt
Agree
Assess
Assign
Assist
Benchmark
Build
Challenge
Communicate
Comply
Concentrate
Conduct
Connect
Consider
Converge
Create
Define
Delay
Deny
Develop
Direct
Discourage
Distribute

Divert
Divide
Empower
Enable
Enact
Estimate
Evaluate
Evolve
Exploit
Find
Focus
Follow
Generate
Get
Guide
Help
Identify
Ignore
Implement
Inform
Innovate
Integrate
Invent
Learn

Leverage
Make
Market
Measure
Migrate
Operationalize
Optimize
Penetrate
Position
Produce
Progress
Propose
Recreate
Redirect
Release
Renew
Repeat
Require
Resist
Respond
Reveal
Strategize
Streamline
Structure
Support

CONTINUE VERBS

PERFORMANCE

Continue

PROCESS

Endure
Hold onto
Keep
Maintain
Persevere
Preserve
Proceed
Prolong
Protect
Remain
Stay
Survive
Sustain
Tolerate
Uphold
Withstand

FINISH VERBS

PERFORMANCE

Arrive
Avoid
Beat
Cancel
Cease
Destroy
Descontinue
Eliminate
End
Exit
Halt
Leave
Release
Stop
Win

PROCESS

Abandon
Attain
Block
Conclude
Complete
Defeat
Dismantle
Drop
Obtain
Reach
Resolve
Retreat
Settle
Sign
Solve
Surrender
Withdraw



2. HAVE A MESSAGE & REINFORCE IT

ADJECTIVES

SIZE -BAR CHARTS

Most.....Least
Grew.....Shrank
Largest.....Smallest
Higher.....Lower
Higher.....Lower
Leading.....Trailing
Greater.....Fewer
More than.....Lesser than
Better than....Worse than
All of.....Part of

SIZE - RANKED BAR CHARTS

More.....Less
First.....Last
Upward.....Downward
Proceeds.....Follows
Maximum.....Minimum
Rising.....Falling

RATIOS (PIE CHARTS)

Large porportion.....Small proportion
Large percentage.....Small percentage
As much.....Not as much
Largest.....Smallest
A lot.....A little bit
Main part.....Lesser part
Majority.....Minority
More than.....Lesser than
Most.....Least
All of.....Part of





2. HAVE A MESSAGE & REINFORCE IT

ADVERBS

SINGLE LINE CHARTS

Climb.....Steady/decline
Improve.....Stagnate
Increase.....Flatten/decrease
Recover.....Deteriorate
Rise.....Stabilize/downturn
Spike.....Maintain/fall
Surge.....Plummet
Jump.....Slump
Peak.....Decline
Outpace.....Fall behind



MULTI-LINE CHARTS

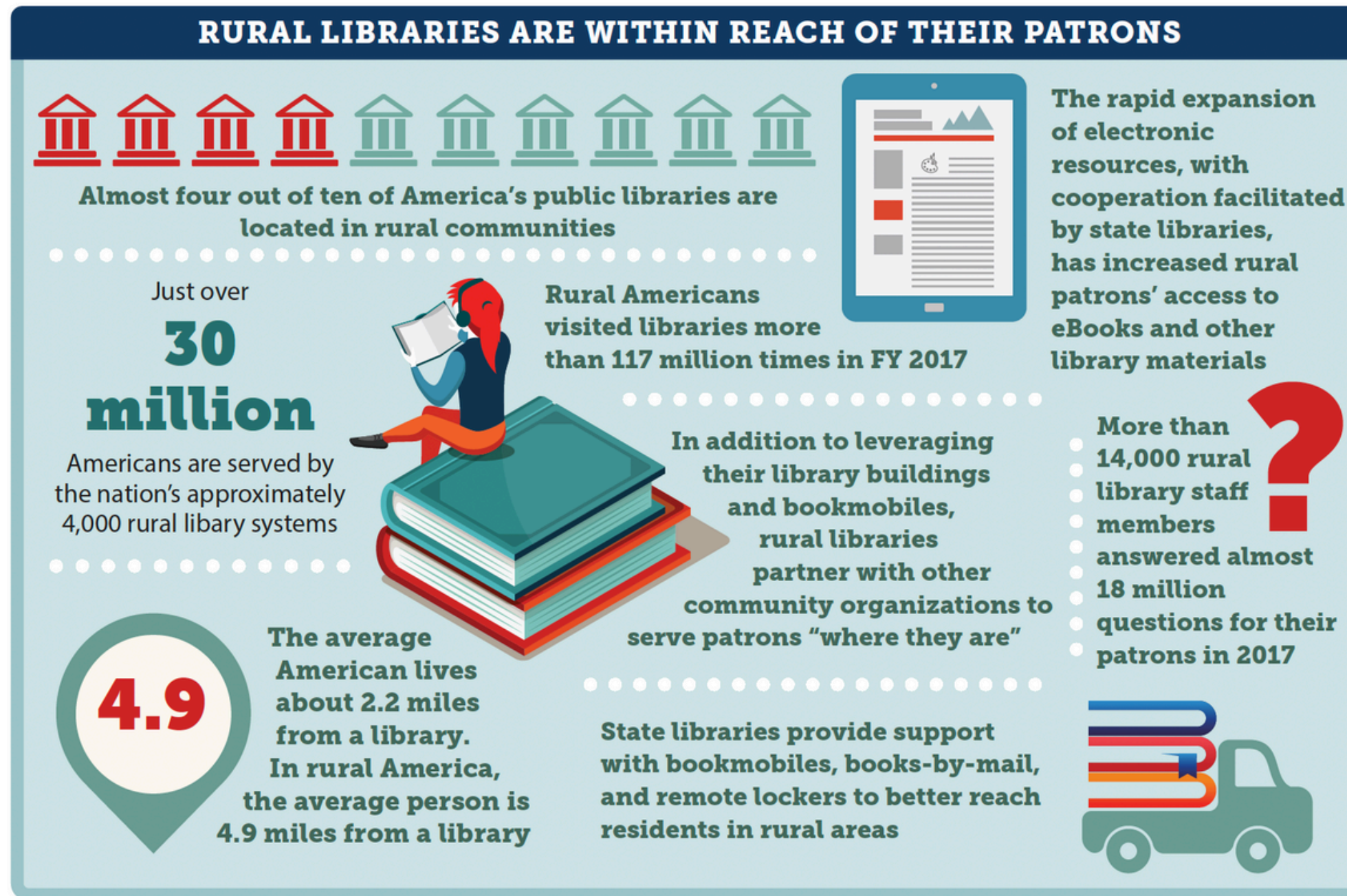
Close.....Move Apart
Converge.....Diverge
Move together.....Separate
Tighten/overlap.....Far apart



BEST PRACTICE

3 GIVE CONTEXT TO DATA

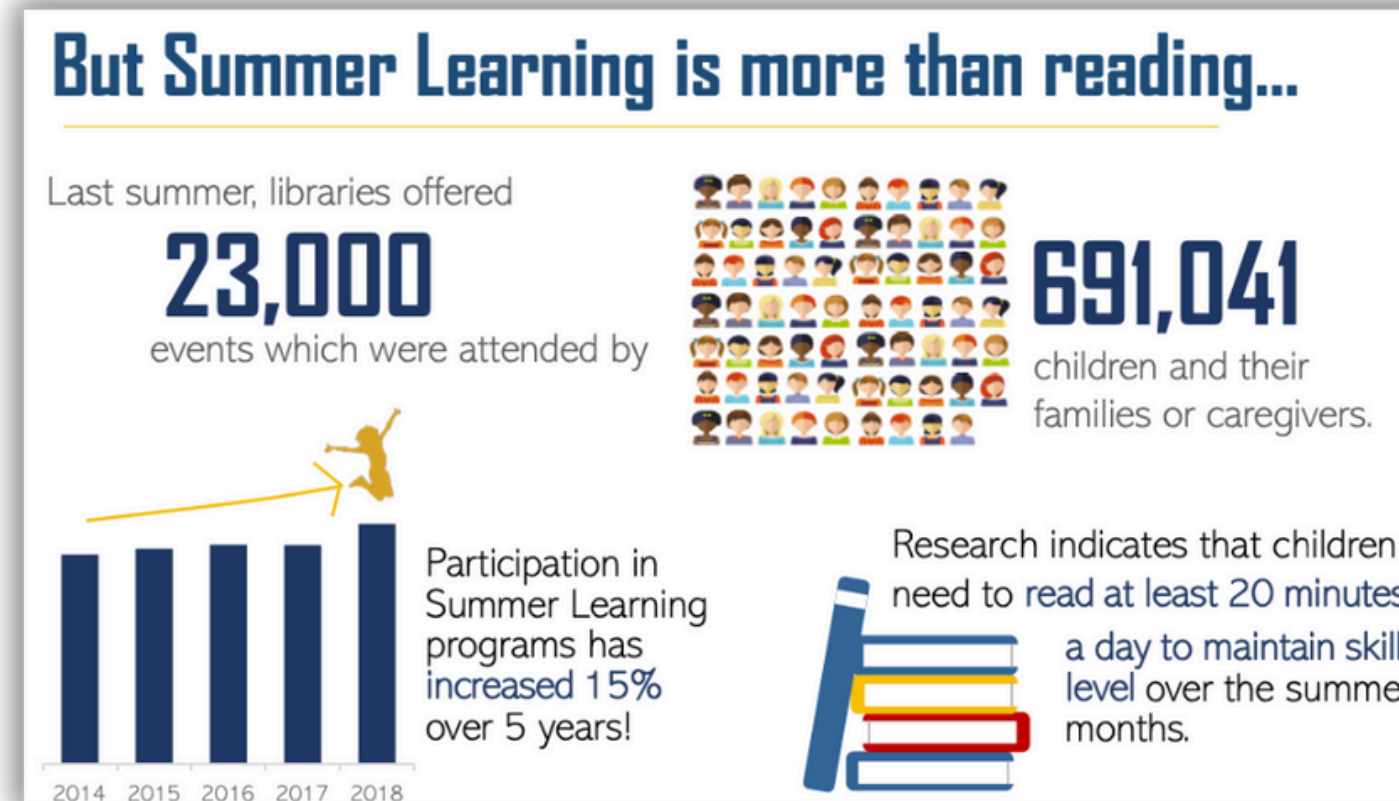
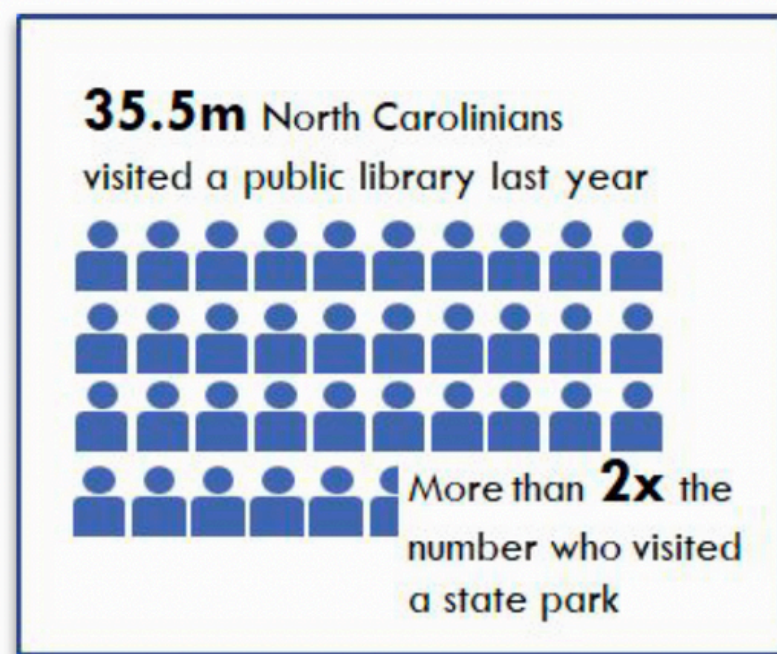
COMPARE OR RELATE
TO SOMETHING
MEANINGFUL



[source](#)

3. GIVE CONTEXT TO DATA

RATIOS, REFERENCE POINTS, EXTERNAL RESEARCH



COMPARE OR RELATE TO SOMETHING MEANINGFUL

Make data points more meaningful by comparing them to relatable things and developing a sense of scale.

TIME

Relate how long it takes, (work hours, boil water) or how fast it goes (blinking, speed limits).

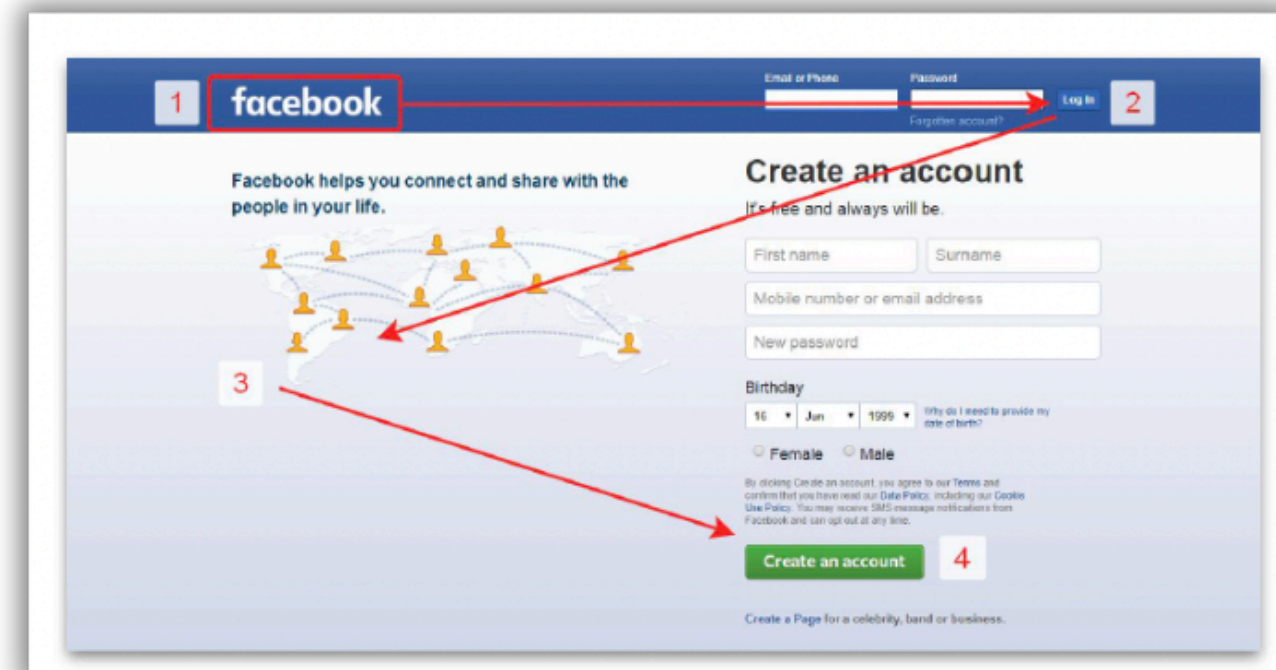
SIZE

Compare to relatable lengths (arm's length, width of a car lane), area (football field, city block), volume (Olympic swimming pool).

QUANTITY

Use per person, per visit, per \$1, per item...

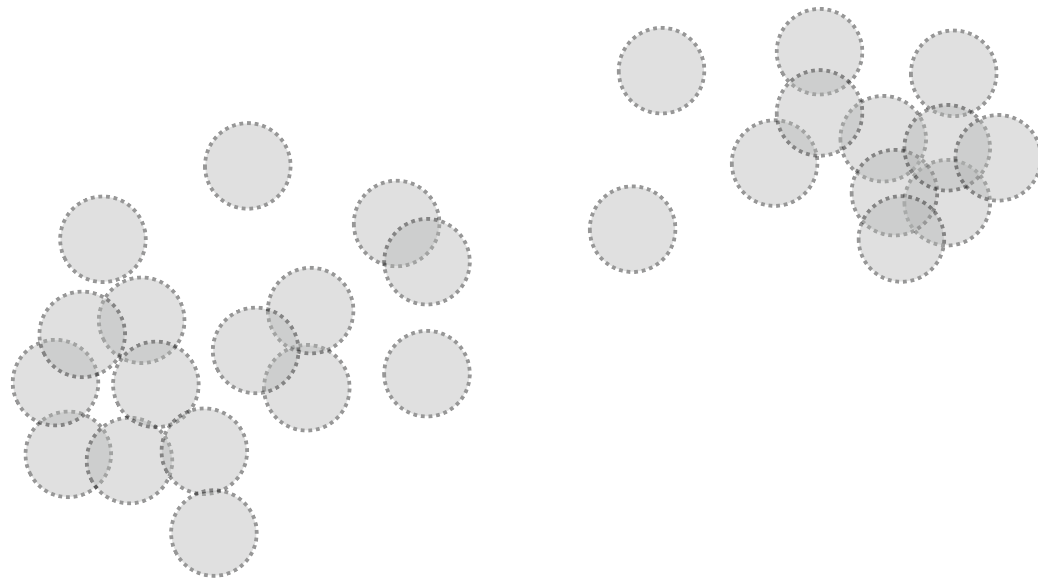
4 BEST PRACTICE INTENTIONAL ARRANGEMENT



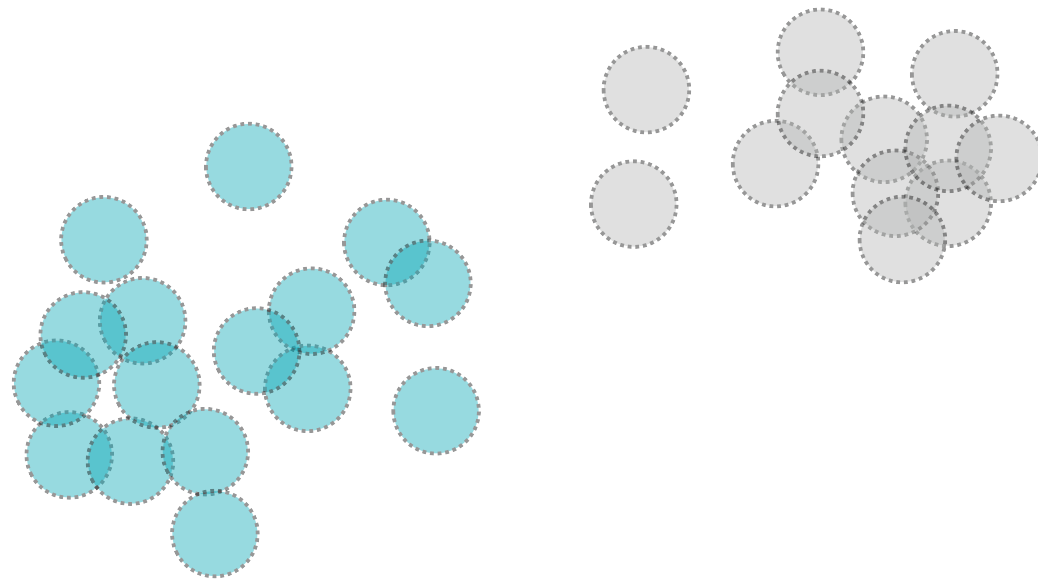
4. INTENTIONAL ARRANGEMENT

GESTALT PRINCIPLES

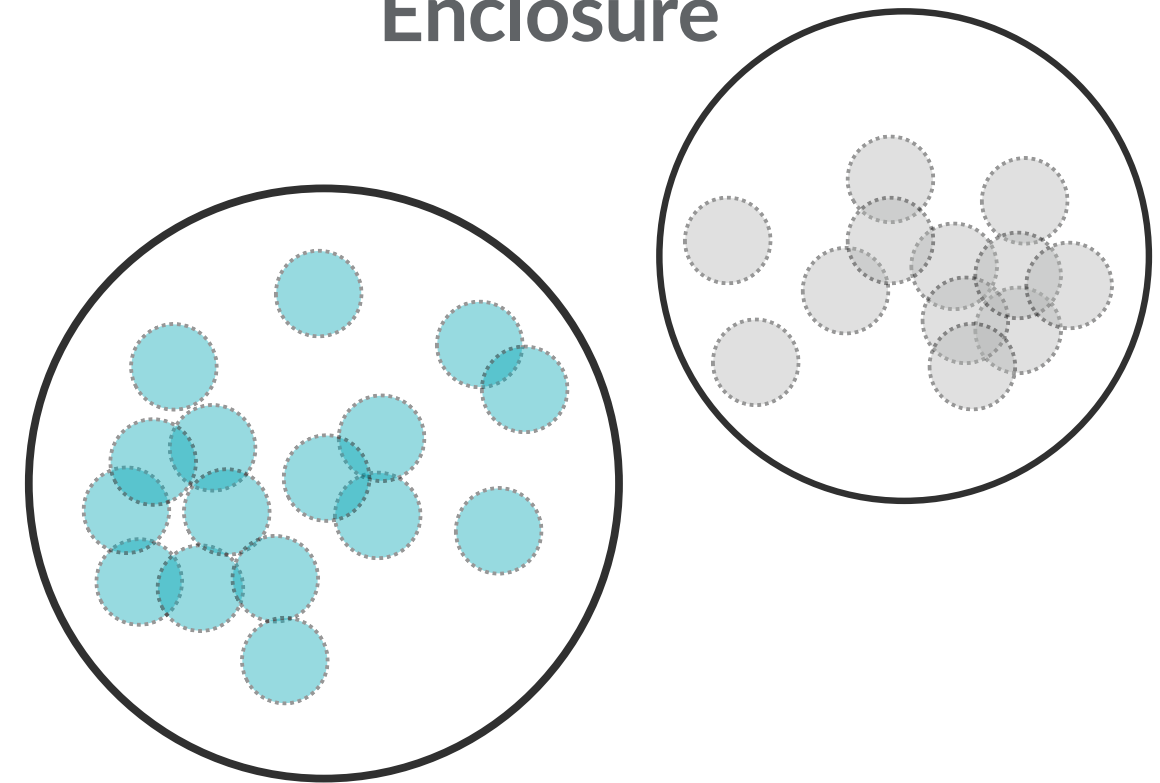
Proximity



Similarity



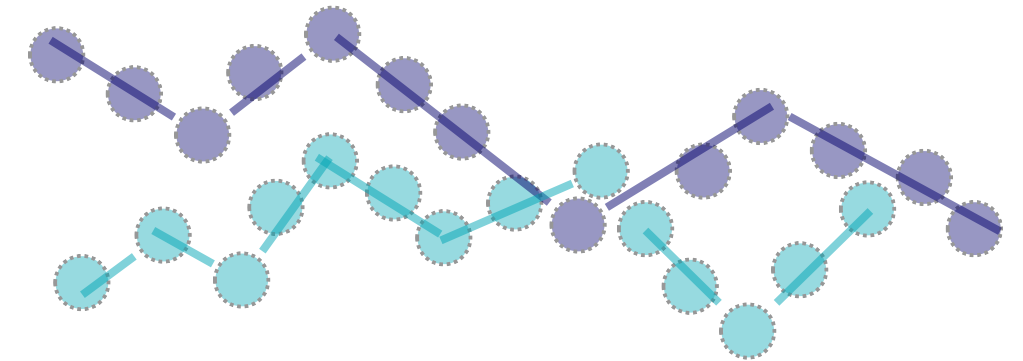
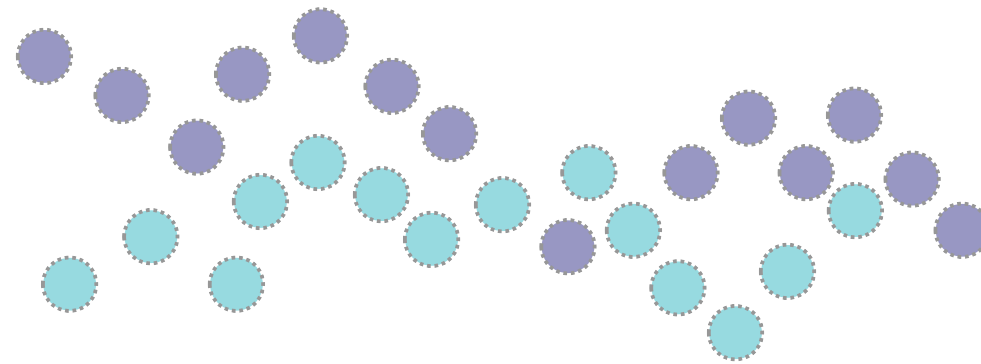
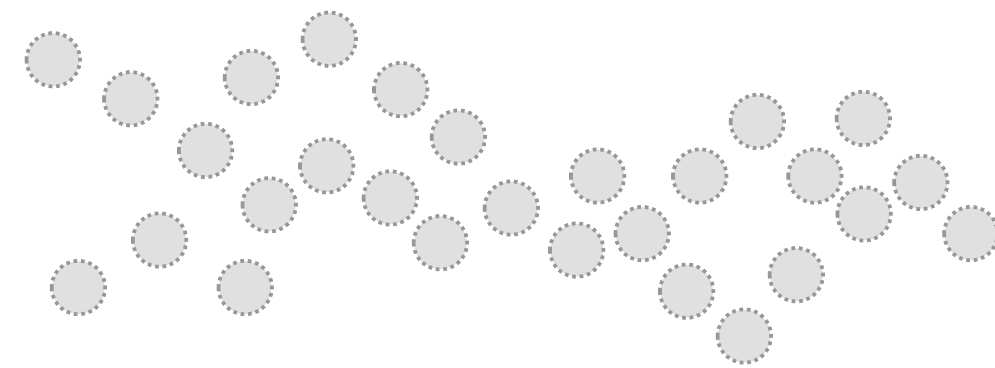
Enclosure



4. INTENTIONAL ARRANGEMENT

GESTALT PRINCIPLES

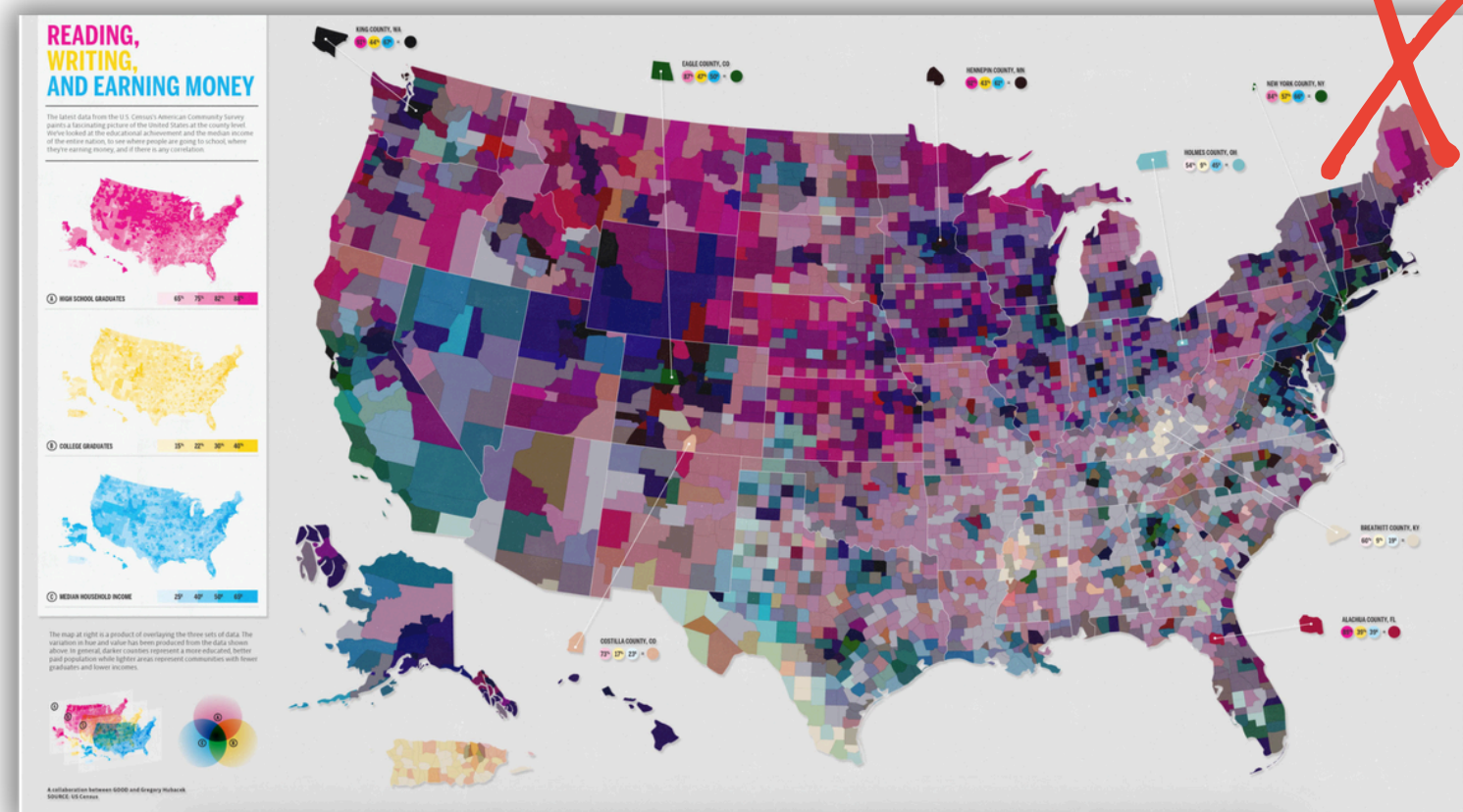
Connection



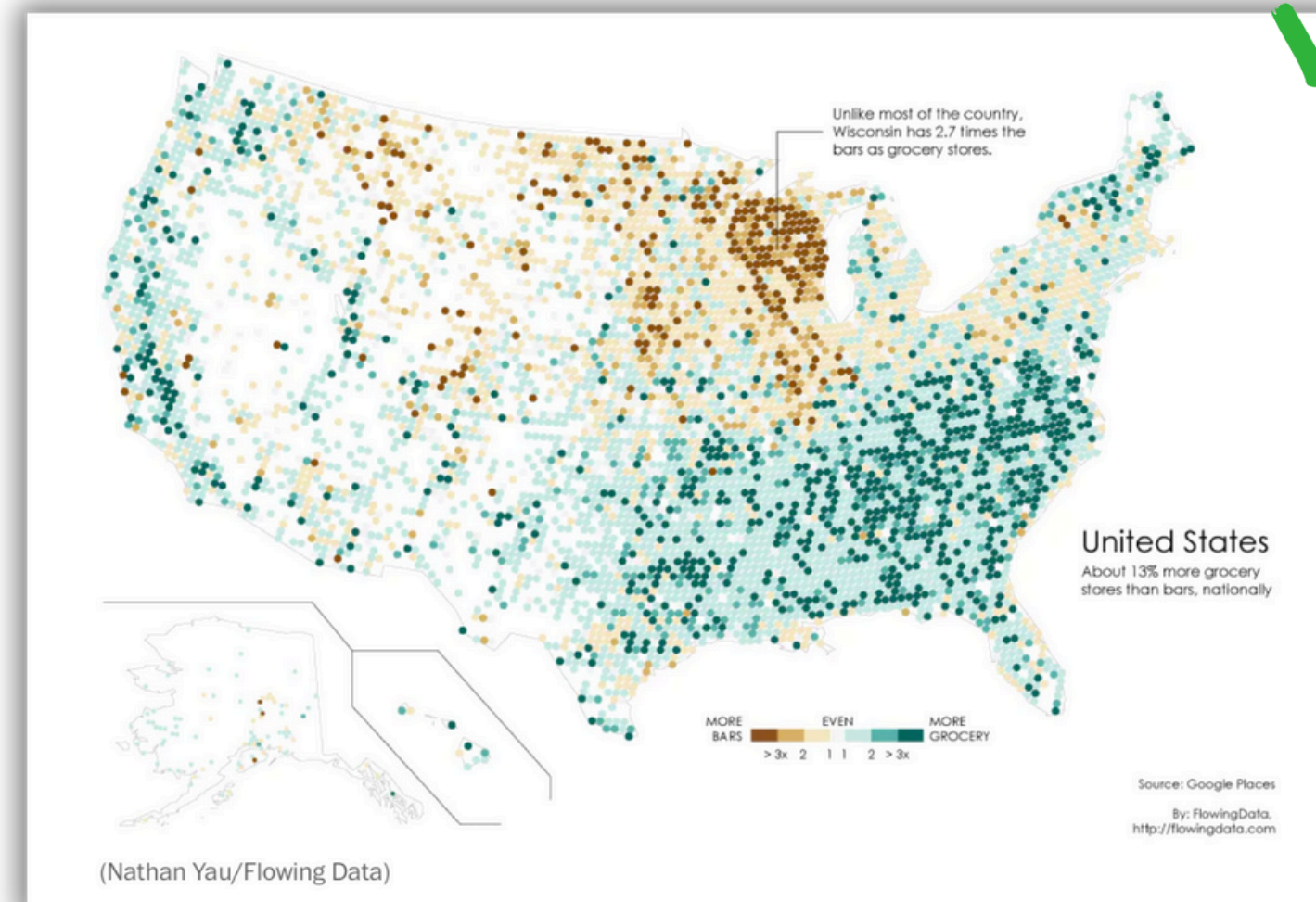
5

BEST PRACTICE

KEEP IT SIMPLE & PREDICTABLE



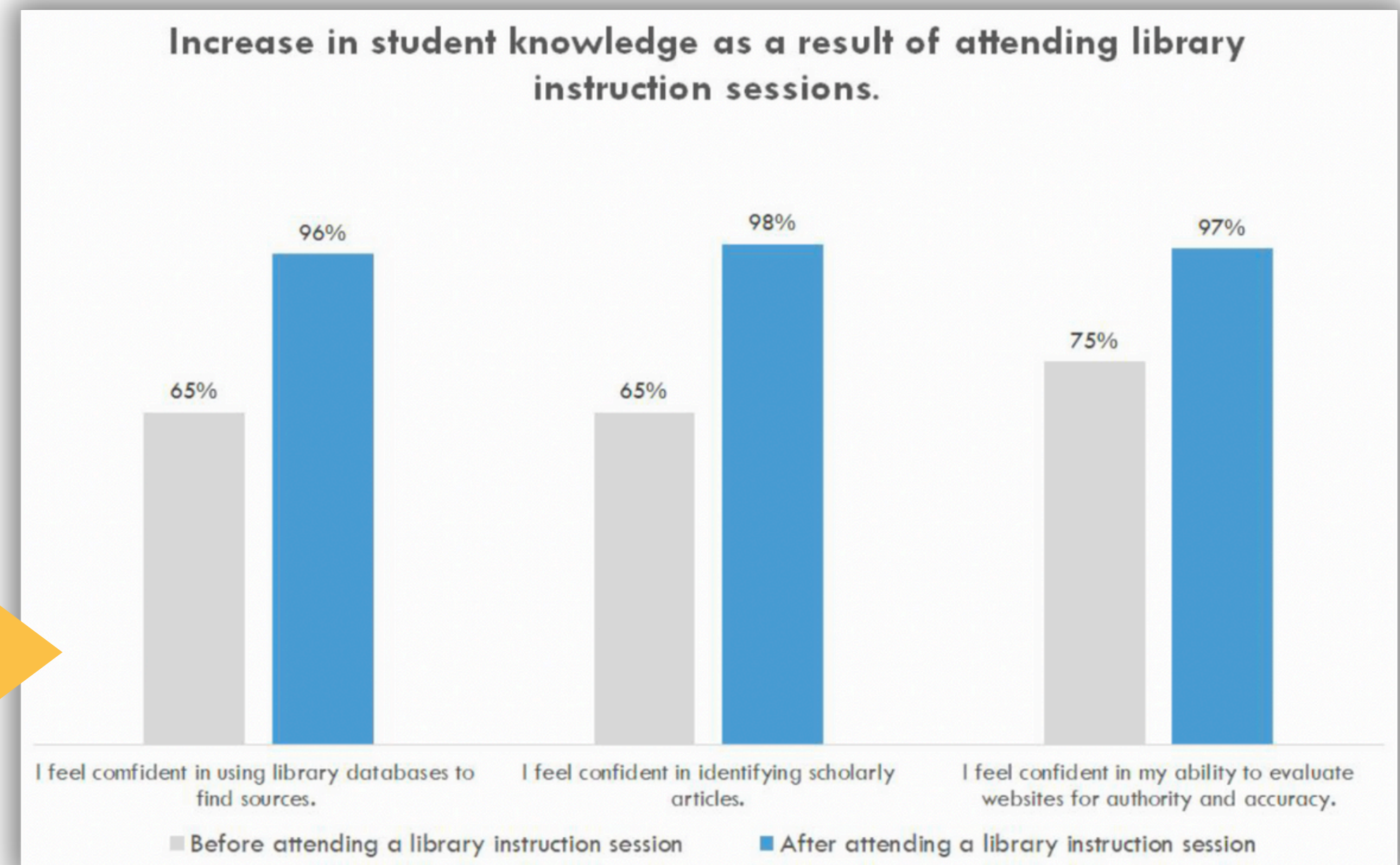
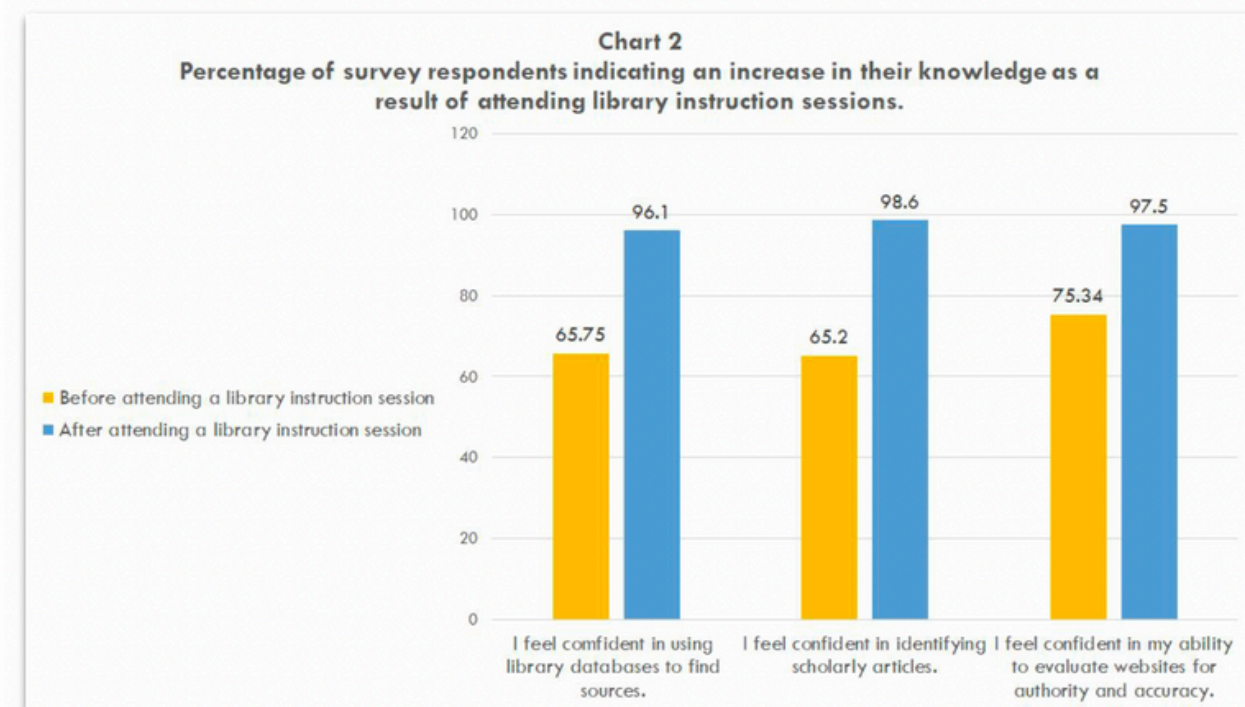
[Source](#)



[Source](#)

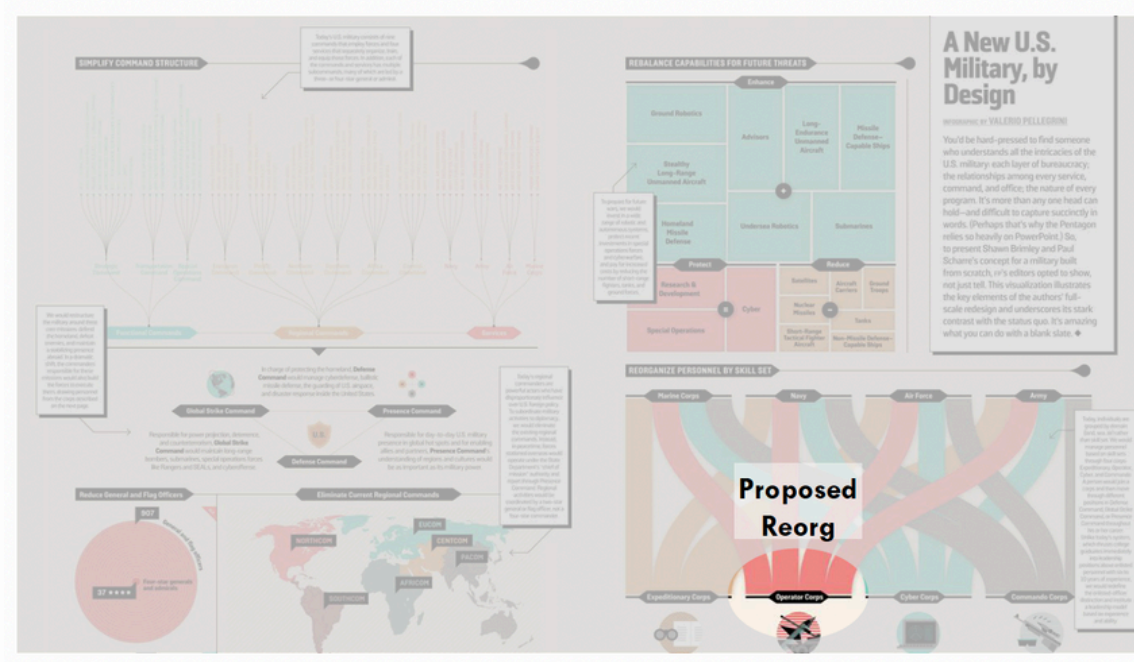
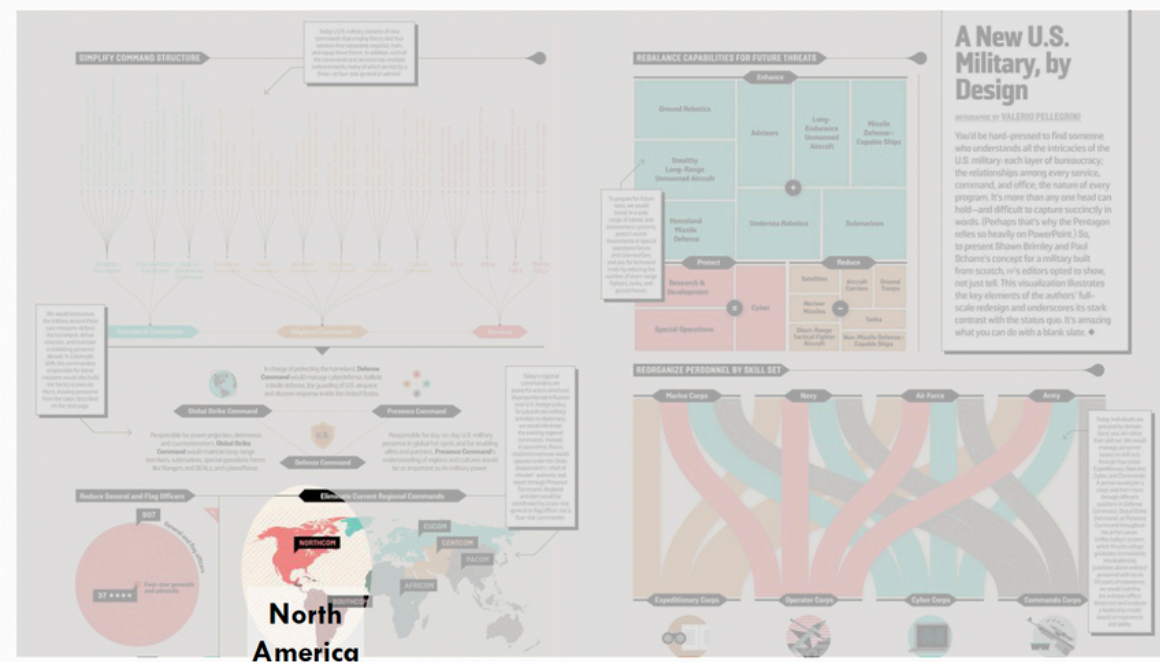
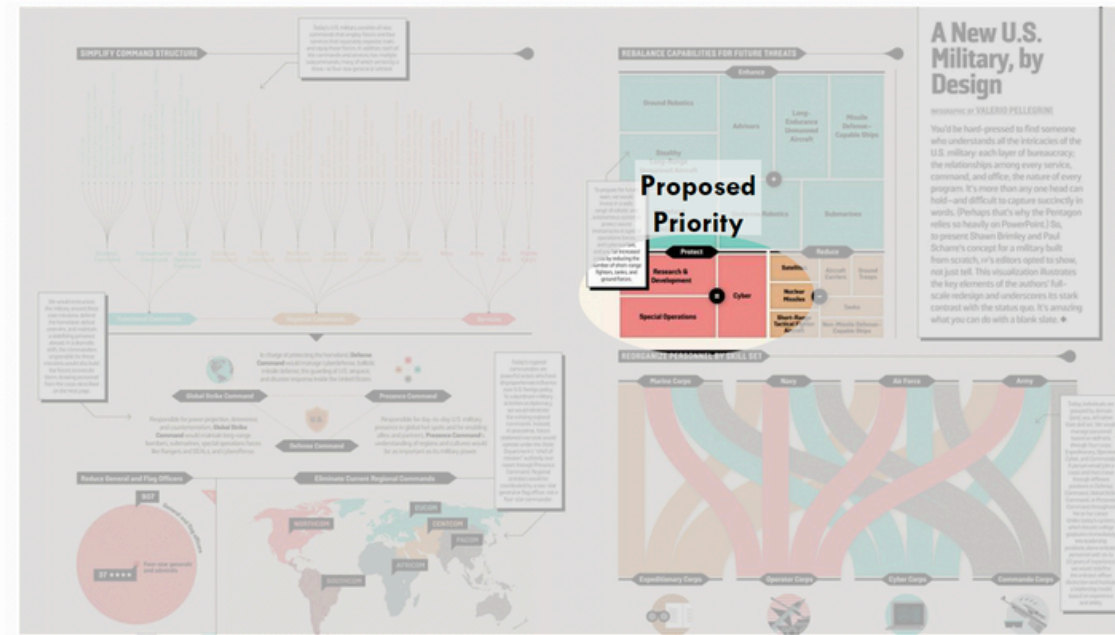
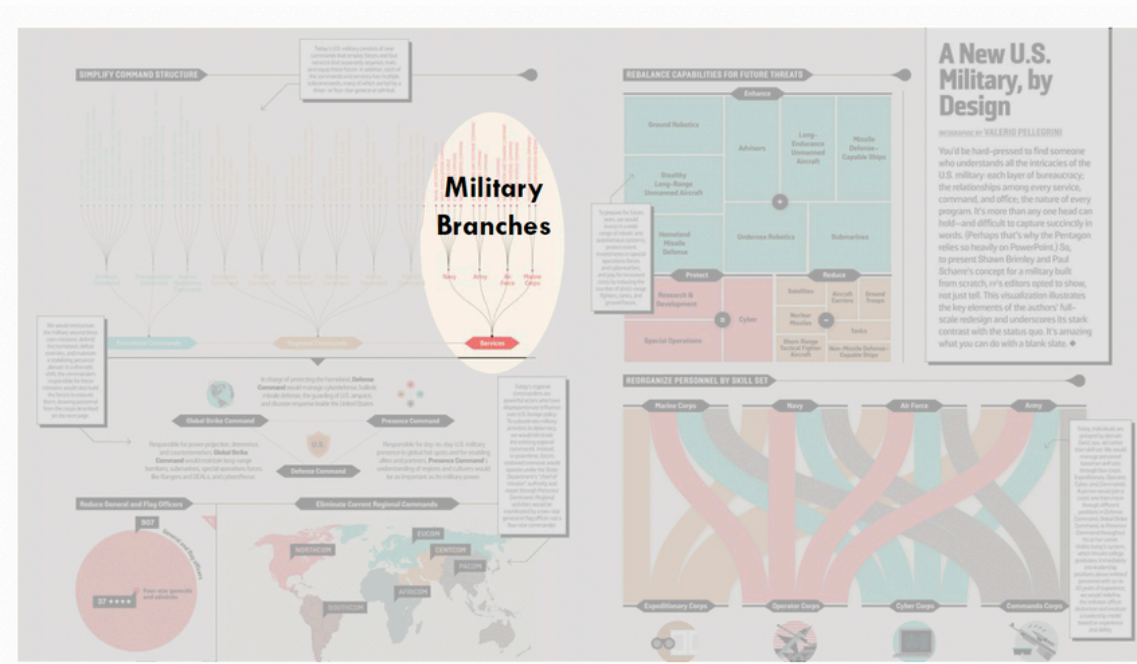
5. KEEP IT SIMPLE & PREDICTABLE

REMOVE CLUTTER



5. KEEP IT SIMPLE & PREDICTABLE

USE COLOR CONSISTENTLY



[Source](#)

5. KEEP IT SIMPLE

FONT

Limit to 2-3 fonts

WHEN USED DAILY FOR 8 WEEKS...

👉 100% OF USERS 👉

OF SENEPLEX COMPLEX

51.9% INCREASED FIRMNESS

23.3% INCREASE IN CELL RENEWAL!

168% INCREASED COLLAGEN SYNTHESIS

48.7% INCREASED LUMINOSITY

25% DECREASED SAGGING

55.7% REDUCTION OF FINE LINES & WRINKLES

54.2% INCREASED MOISTURE & HYDRATION

SEE

👉

👉

Create a visual hierarchy

NO HIERARCHY

On the Moon!
'A Giant Leap' for All of Man-
kind Americans First to Walk on
Dead Lunar Surface
Space Center, Houston —
Lorem ipsum dolor sit amet, ut
alia ludus evertitur vel, pri ut
maiorum maluisset. Eam ut
mucius option dissentiet. Ex
graece labore eirmod sit. Per-
fecto incorrupte no sea. Eius
utroque periculis eos te. Aliquip
molestie perpetua eum ex, sumo
laudem deseruisse mel no. Libris
tacimates antiopam pri at. Sea
no fugit exerci partiendo.

LIMITED HIERARCHY

ON THE MOON!
*'A Giant Leap' for All of
Mankind*
Americans First to Walk on
Dead Lunar Surface
Space Center, Houston —
Lorem ipsum dolor sit amet, ut
alia ludus evertitur vel, pri ut
maiorum maluisset. Eam ut
mucius option dissentiet. Ex
graece labore eirmod sit. Per-
fecto incorrupte no sea. Eius
utroque periculis eos te. Aliquip
molestie perpetua eum ex, sumo
laudem deseruisse mel no. Libris
tacimates antiopam pri at.

IMPROVING...

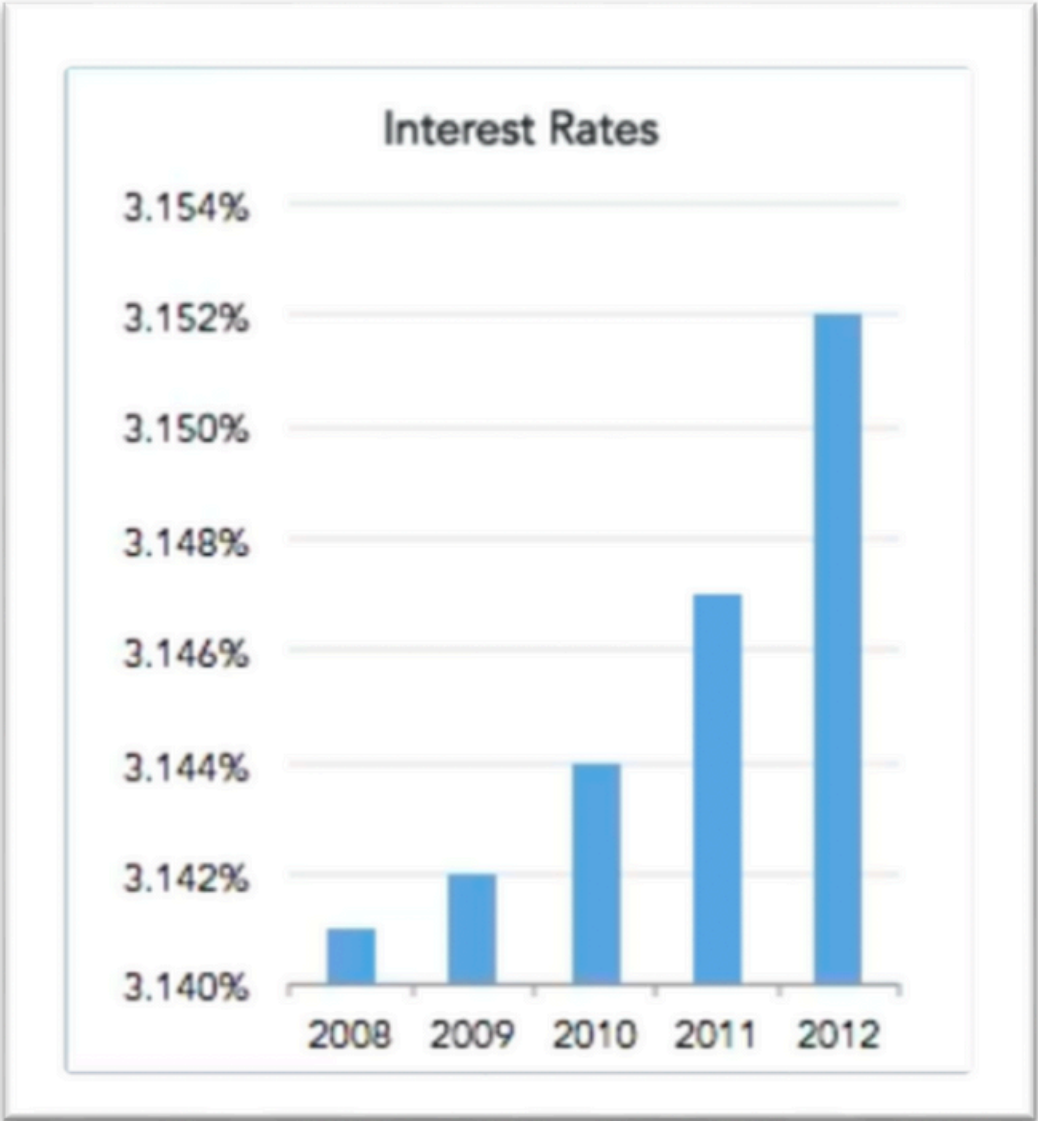
ON THE MOON!
*'A Giant Leap' for All of
Mankind*
Americans First to Walk on
Dead Lunar Surface
Space Center, Houston — Lorem
ipsum dolor sit amet, ut alia ludus
evertitur vel, pri ut maiorum malu-
isset. Eam ut mucius option dissen-
tiet. Ex graece labore eirmod sit.
Perfecto incorrupte no sea. Eius
utroque periculis eos te. Aliquip
molestie perpetua eum ex, sumo
laudem deseruisse mel no. Libris
tacimates antiopam pri at.

MUCH BETTER!

ON THE MOON!
*'A Giant Leap' for
All of Mankind*
Americans First to Walk on
Dead Lunar Surface
Space Center, Houston — Lorem
ipsum dolor sit amet, ut alia ludus
evertitur vel, pri ut maiorum malu-
isset. Eam ut mucius option dissen-
tiet. Ex graece labore eirmod sit.
Perfecto incorrupte no sea. Eius
utroque periculis eos te. Aliquip
molestie perpetua eum ex, sumo
laudem deseruisse mel no. Libris
tacimates antiopam pri at.

PRACTICE

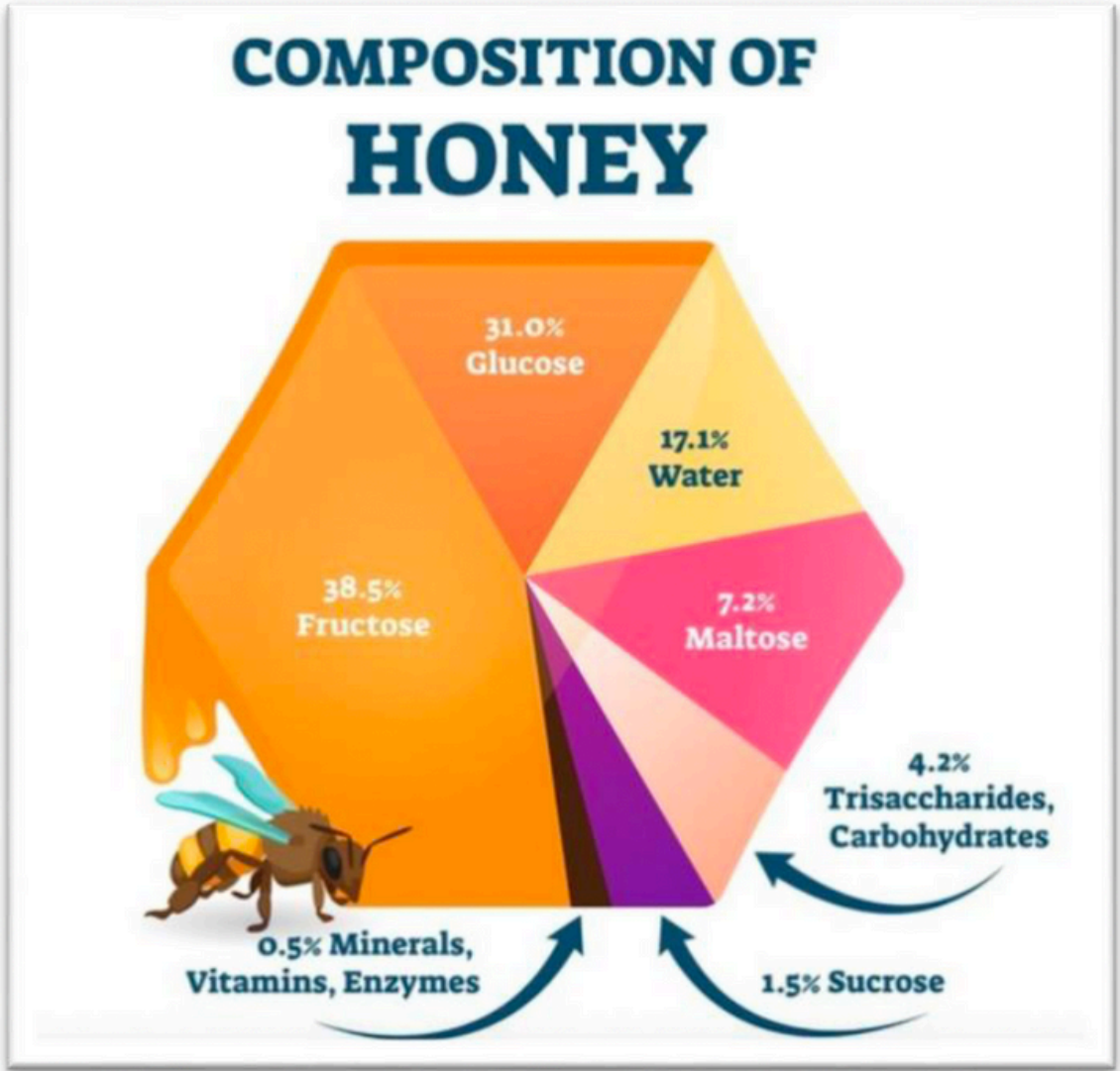
Visualization 1



Visualization 2

Trust rank	Index rank	Borough	Amount approved (£)	Number of grants
1	3	Tower Hamlets	£9,692,642	269
2	2	Hackney	£7,809,608	225
3	12	Southwark	£7,266,118	232
4	14	Camden	£6,140,419	136
5	4	Islington	£5,424,137	156
6	8	Lambeth	£5,257,941	156
7	2	Newham	£5,217,075	154
8	13	Hammersmith and Fulham	£4,085,708	109
9	29	Merton	£3,656,112	113
10	20	Croydon	£3,629,066	127
11	9	Lewisham	£3,537,049	144
12	17	Westminster	£3,357,911	100
13	15	Ealing	£3,057,709	84
14	30	Bromley	£3,038,621	131
15	19	Kensington and Chelsea	£2,979,468	74
16	11	Brent	£2,898,224	85
17	10	Greenwich	£2,837,658	87
18	24	Barnet	£2,796,587	99
19	21	Wandsworth	£2,592,453	89
20	5	Waltham Forest	£2,505,730	131
21	28	Sutton	£2,468,511	87
22	18	Hounslow	£2,383,393	75
23	7	Haringey	£2,360,290	101
24	22	Redbridge	£2,285,173	75
25	33	Redmond upon Thames	£2,249,983	133

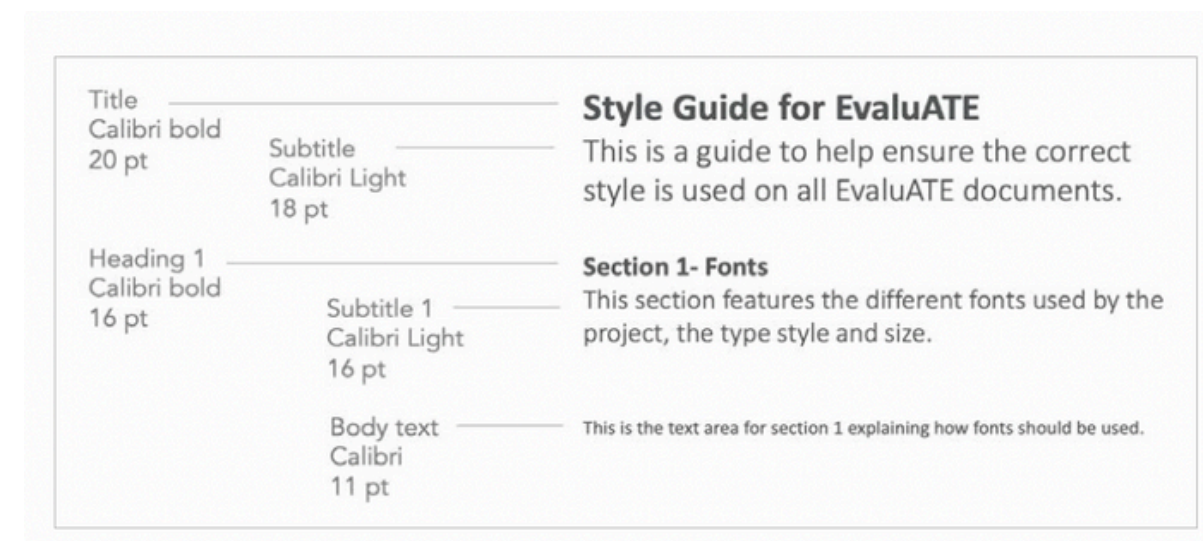
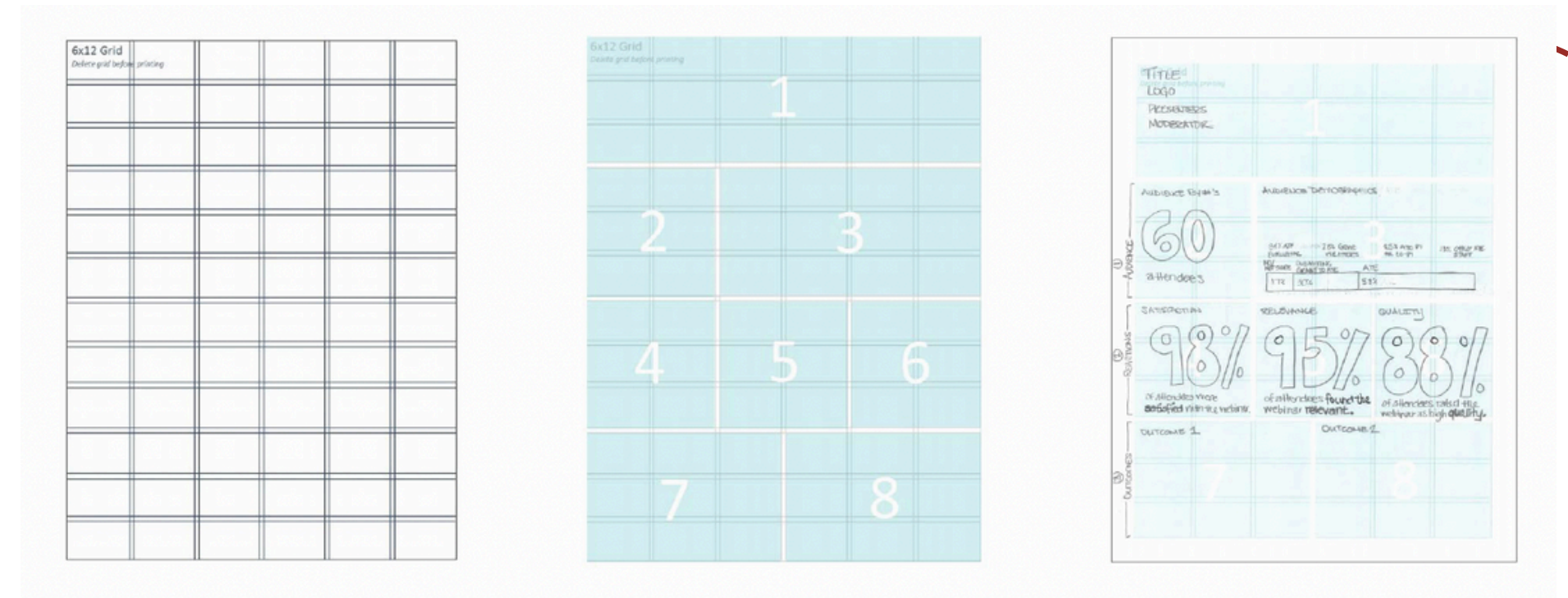
Visualization 3



1 PAGE REPORT TOOLKIT

Ten Step Design Process

1. Identify your audience
2. Identify the purpose
3. Prioritize the information
4. Choose a grid
5. Draft the layout
6. Create an intentional visual path
7. Create a purposeful hierarchy
8. Use white space
9. Get feedback
10. Triple check for consistency



10 steps Handout



[Source](#)

USE A GRID TO PLOT YOUR INFORMATION



Tip 1: sketch it out!

Tip 2: Check out PowerPoint. Use the QR code to find tips on PowerPoint visualizations.





DATA VIZ TOOLS

Data Visualization
Programs/Software
Static and Interactive
Microsoft PowerPoint

Adobe Illustrator

Tableau

Piktochart

Canva

Venngage

Visme

Infogram

Miro

Animated

Powtoon

Animaker



Typography
Font squirrel

MyFont

FontPair

Iconography
Noun Project

Color

Adobe Color CC

Picular

Colorbrewer2 (mapping)





What questions do you have?

Email me at
amanda.johnson@dnocr.nc.gov

Learn more about library data resources from
the State Library of NC at:

<https://statelibrary.ncdcr.gov/services-libraries/resources-library-staff/data-and-evaluation>



SOURCES

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Margolis, M. (2019). Story 10x: Turn the impossible into the inevitable. Storied.

Schwabish, J. (2021). Better Data Visualizations. Columbia Press.

