

CSE 332
INTRODUCTION TO VISUALIZATION
INFOGRAPHICS DESIGN

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Lecture	Topic	Projects
1	Intro, schedule, and logistics	
2	Basic tasks and data types	
3	Data sources and what to look out for	Project 1 out
4	Data preparation and representation	
5	Data reduction, notion of similarity and distance	
6	Dimension reduction	
7	Bias, introduction to plotly and plotly Dash	Project 2 out
8	Visual perception and cognition	
9	Visual design and aesthetic	
10	Introduction to D3	
11	Cluster analysis	
12	High-dimensional data VIS: numerical data (linear schemes)	
13	High-D data VIS: non-linear embeddings, categorical data	Project 3 out
14	Visualization of spatial data: applications and data origins	
15	Visualization of spatial data: volume rendering	
16	Visualization of spatial data: raycasting, transfer functions	
17	Scientific visualization	
18	Non-photorealistic and illustrative rendering	Project 4 out
19	Midterm review	
20	Midterm	
21	Midterm discussion	
22	Principles of interaction	
23	Visual analytics and the visual sense making process	Project 5 out
24	Visualization of graphs and hierarchies	
25	Visualization of time-varying and streaming data	
26	Maps	
27	Memorable visualizations, visual embellishments	
28	Infographics: principles and design	

WHAT ARE INFOGRAPHICS?

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

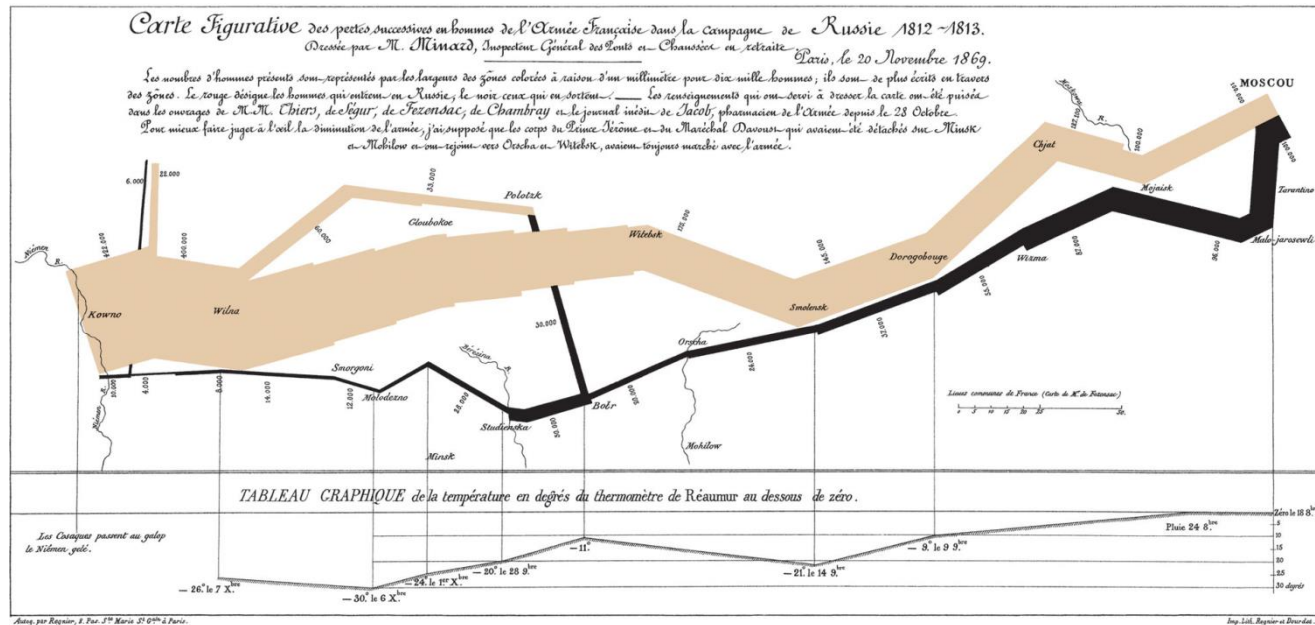
DESIGN RULES TO CONSIDER

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.

VERY EARLY EXAMPLE

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 ...

MATTHEW MCNEW.

720 220 2307
mmcnew@mines.edu

Resume

Education

Colorado School of Mines

Major:
Computer Science

May 2013

GPA: 3.7

Minor:
Electrical Engineering

Minor:
Mathematics

Student Body President

Colorado School of Mines
2012-2013

← Campaign Logo

Skills



Decent ————— Great

Windows

Linux

Mac OS

Internships:

2012
PIVOTAL LABS

Ruby on Rails
Agile Development
Pair Programming

2011
CableLabs
RESEARCHING CABLE TECHNOLOGY

Tested the Effectiveness
of Amazon Kindle's
Silk Browser

Volunteer:

Led A WWOOFing
Trip to Rural Brazil



Projects:

Freelance Programmer

Engle Ridge Academy
After School Scheduling
PHP and MYSQL

Simplified

Designed and Implemented
Single Sign On Solution
With ASP.NET and IIS

School:

Graduated High School
with a Valedictorian

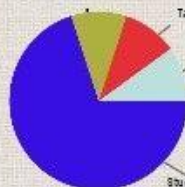
Math Counts Coach

Tau Beta Pi

Blue Key

Student Government

Activities



Interests

Organic Farming Soccer

Travel Entrepreneurship Comedy



Number of Internships Completed



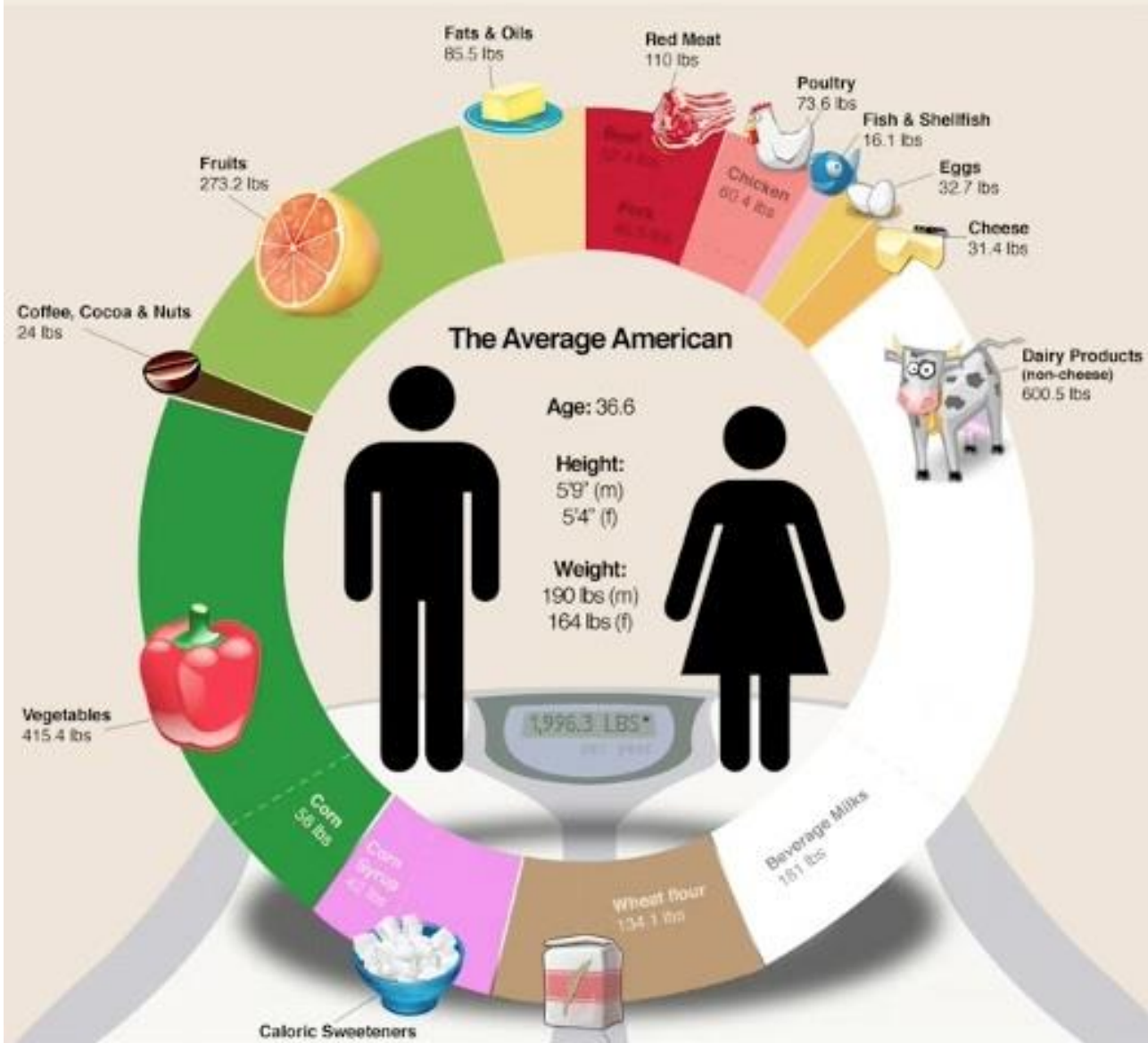
Number of Jobs Employed



Number of Countries Traveled

WHAT ARE WE EATING?

What the Average American Consumes in a Year



EDUCATION AROUND THE WORLD

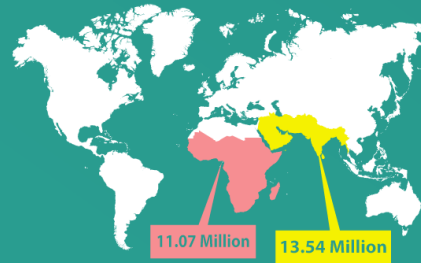
There are **1.4 Billion** students on Earth.



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

15 to 24 years old has not completed primary school and lacks 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

In some developing countries, one quarter to one-half of youth who have graduated from primary school cannot read a single sentence.



OF THE 775 MILLION ILLITERATE ADULTS

TWO-THIRDS ARE WOMEN





■ STATES WITHOUT BULLYING LAWS
 ■ FIRST STATE WITH BULLYING LAW

STUDENT BULLYING



■ WORST STATES TO LIVE IN FOR BULLYING K-12

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.

bul·ly·ing

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 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/delinquent 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.



280,000

STUDENTS ARE PHYSICALLY ATTACKED IN SECONDARY SCHOOLS EACH MONTH

160,000

STUDENTS MISS SCHOOL EACH DAY FOR FEAR OF BEING BULLIED

77%

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

43%

FEAR HARASSMENT IN THE BATHROOM AT SCHOOL

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

MORE YOUTH VIOLENCE OCCURS ON SCHOOL GROUNDS AS OPPOSED TO ON THE WAY TO SCHOOL



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

1 OUT OF 4
 STUDENTS WILL BE ABUSED BY ANOTHER YOUTH



1 OUT OF 5
 ADMIT TO BEING A BULLY, OR DOING SOME "BULLYING"



SOURCES:

[HTTP://WWW.COPS.USDOJ.GOV](http://www.cops.usdoj.gov)
[WWW.KEEPSCHOOLSSAFE.ORG](http://www.keepschoolssafe.org)
[WWW.BULLYPOLICE.ORG](http://www.bullypolice.org)

PRODUCED BY:
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[WWW.BUCKFIRELAW.COM](http://www.buckfirelaw.com)

<http://bit.ly/studentbullyingfacts> ©

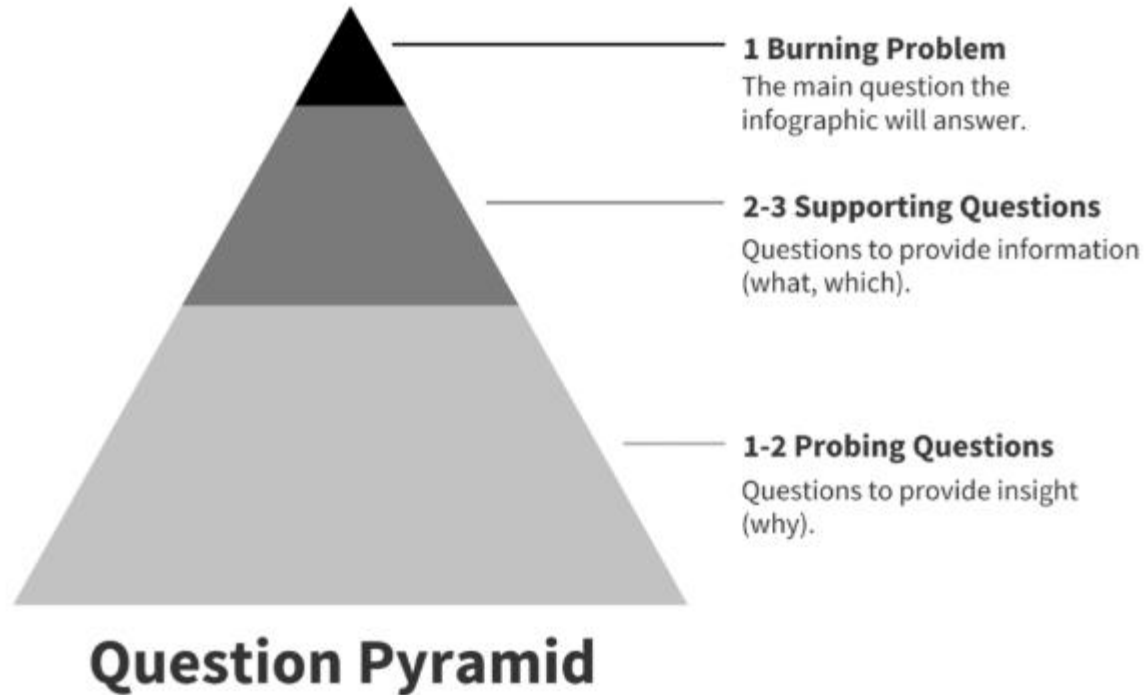
HOW TO MAKE EFFECTIVE INFOGRAPHIC

Five steps (from [Venngage.com](https://venngage.com))

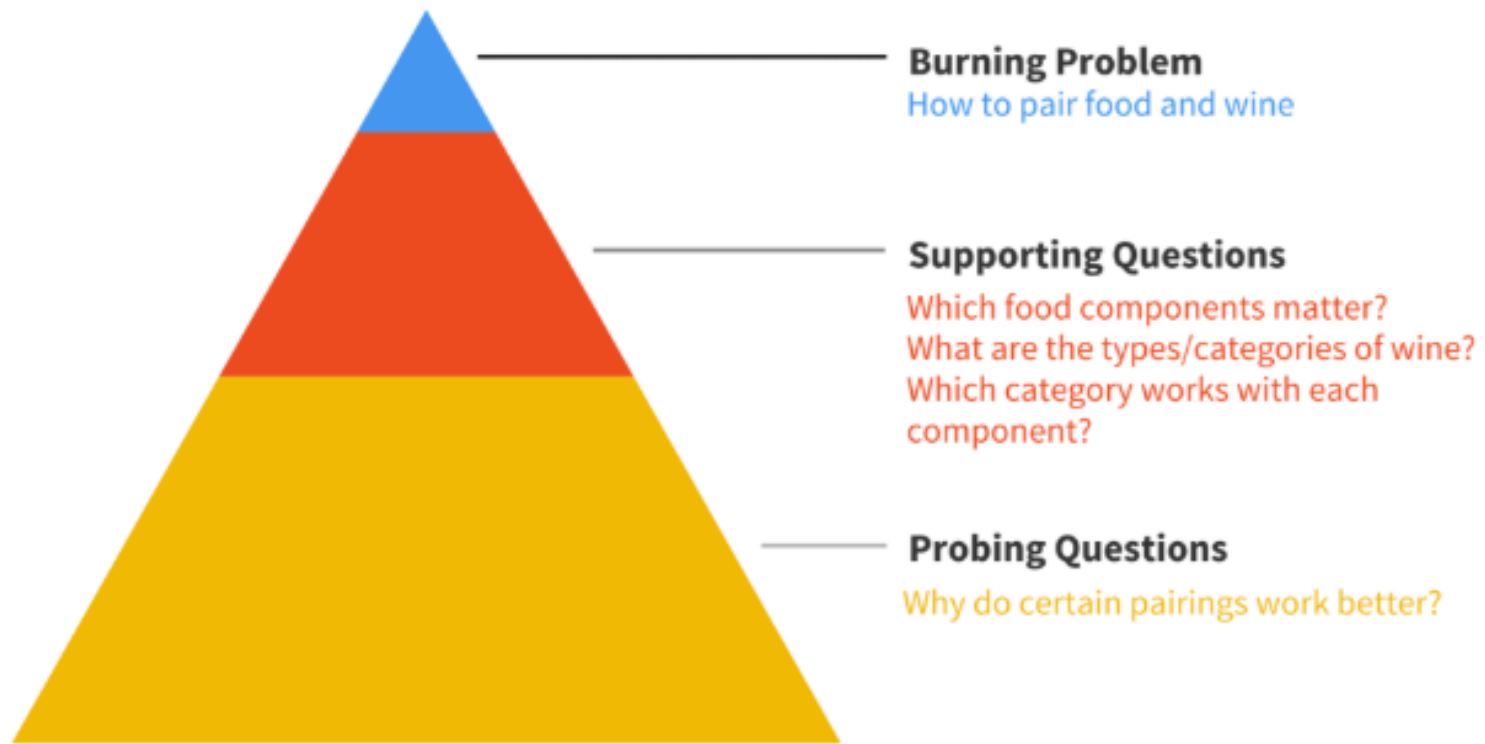
1. Outline the goals of your infographic
2. Collect data for your infographic
3. Visualize the data for your infographic
4. Layout your infographic using an infographic template
5. Add style to your infographic design

STEP 1: OUTLINE YOUR GOALS

Use the question pyramid



EXAMPLE: FOOD – WINE PAIRING



INFOGRAPHIC

FOOD & WINE PAIRING METHOD

DIGITAL EDITION

DIGITAL EDITION IS FREE TO SHARE - ENJOY

EXAMPLES OF HOW TO USE

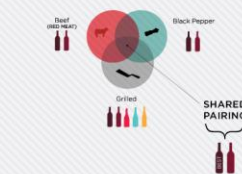
TWO INGREDIENT PAIRING

Arugula and Endive Salad with Blue Cheese



INGREDIENT + PREP METHOD PAIRING

Black Pepper Steak



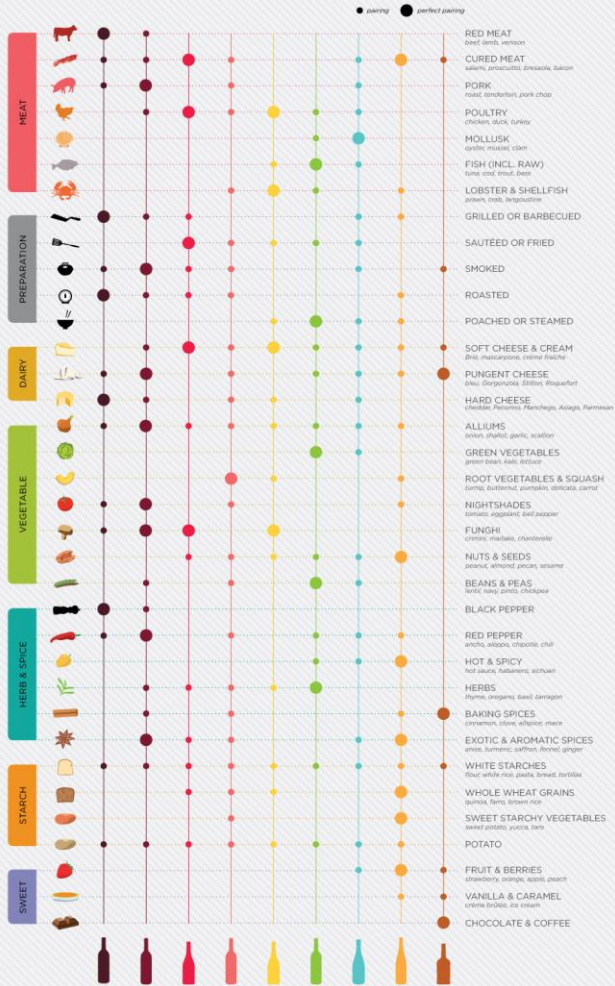
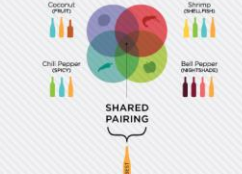
MULTI-INGREDIENT PAIRING

Mushroom Risotto



ADVANCED PAIRING

Spicy Red Curry with Shrimp



Bold Red	Medium Red	Light Red	Rose	Rich White	Light White	Sparkling	Sweet White	Dessert
Malbec Syrah / Shiraz Mourvèdre Pinotage Petite Sirah Touriga Nacional Cabernet Sauvignon Bordeaux Blend Meritage	Merlot Sangiovese Zinfandel Gamay Cabernet Franc Tempranillo Nebbiolo Barbera Côte du Rhône Blend	Pinot Noir Grenache Gamay St. Laurent Carménère Counoise	Provencal Rosé White Zinfandel Loire Valley Rosé Pinot Noir Rosé Syrah Rosé Garracha Rosado Bandol Rosé Tempranillo Rosé Saignole Method Rosé	Chardonnay Sémillon Vignoble Marsanne Roussanne	Sauvignon Blanc Albariño Pinot Blanc Vermentino Maison de Bourgogne Garganega Trebbiano Pinot Gris / Pinot Grigio	Champagne Prosecco Crémant Cava Metodo Classico Sparkling Wine Sparkling Rosé	Moscato Riesling Chenin Blanc Gewürztraminer Late Harvest Whites Alsacian Pinot Gris	Port Sherry Madeira Vin Santo Muscat PX (Pedro Ximénez)



STEP 2: COLLECT THE DATA

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

- **I**nform,
- **C**ompare,
- **C**hange,
- **O**rganize,
- **R**eveal relationships, or
- **E**xplore.

INFORM

Convey an important message or data point that doesn't require much context to understand

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:



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



COMPARE

BAR CHART



COLUMN CHART



BUBBLE CHART



BUBBLE CLOUD



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

PIE CHART



DONUT CHART



PICTOGRAM



TREEMAP



Show similarities or differences among values or parts of a whole

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

STACKED COLUMN CHART



STACKED BAR CHART



Use a stacked area chart to compare trends over time.

STACKED AREA CHART



CHANGE

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.

CHLOROPLETH MAP



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

MAP SERIES



ORGANIZE

Show groups,
patterns, rank or
order

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

LIST



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

TABLE

Cars	Motorcycles	Phones
BMW	Suzuki	Lenovo
Aston Martin	Yamaha	Samsung
Bentley	Harley Davidson	Huawei

Use a flowchart to show order in a process.

FLOWCHART



Otherwise, show rank or order with a bar chart, column chart, bubble chart, or pyramid chart.

BAR CHART



COLUMN CHART



BUBBLE CHART



PYRAMID



RELATIONSHIP

Reveal more complex relationships among things

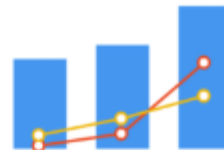
Use a scatter plot when you want to display two variables for a set of data.

SCATTERPLOT



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

MULTI-SERIES PLOT



EXPLORE

Add interaction

- filtering, sorting, and drilling down
- can't do with a static chart
- but useful for online infographics displays
- will discuss later

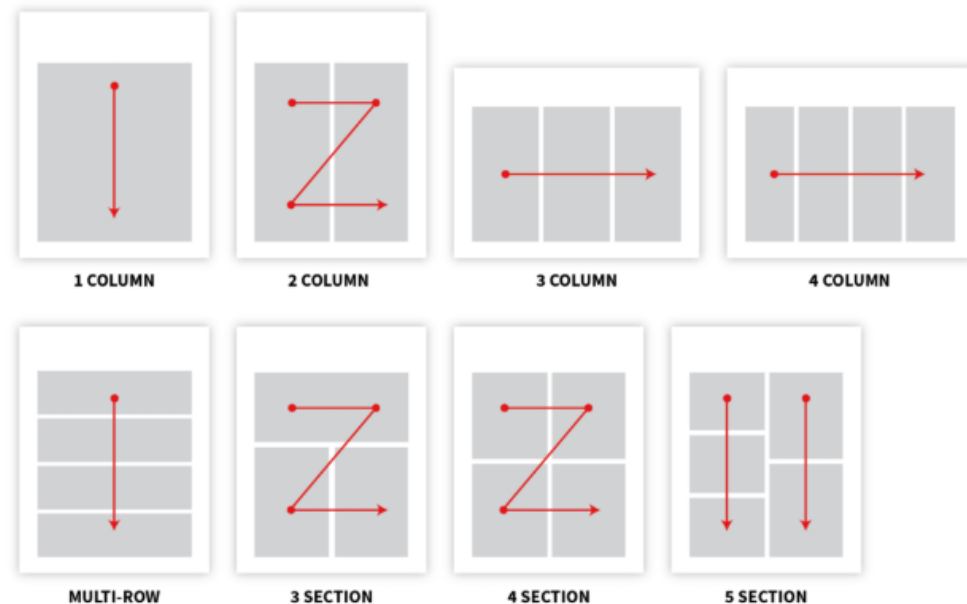
STEP 4: LAYOUT

Create a natural flow

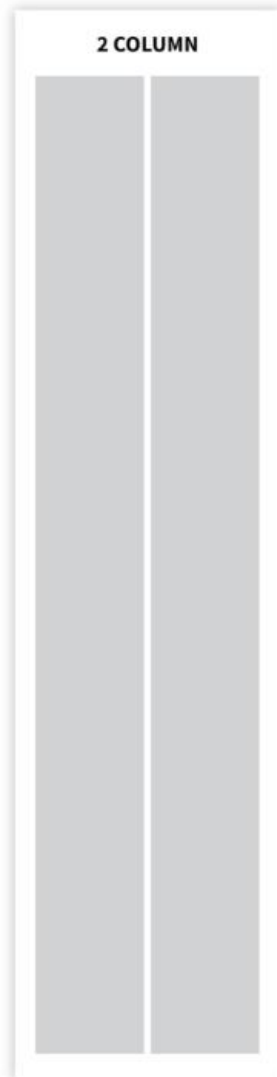
- could use the question pyramid to guide the layout
- burning question into header
- follow with charts to address the supporting questions
- finish with the probing questions

Use a grid layout

- guides the reader's eye
- symmetrical grid
- consider that people read
 - top to bottom
 - left to right



TWO COLUMNS FOR COMPARISONS



What's the difference?

UI vs UX

UI
USER INTERFACE

UX
USER EXPERIENCE

UI is Visual Design
The visual design elements that are on the look and feel of the background.

UX is Interaction Design
The interaction design of what the focus is on the user's experience and how they interact with the product.

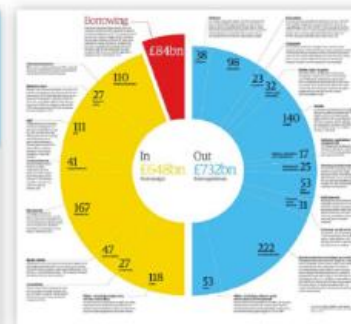
UI is based on Design Trends & Brand Guidelines.

UX is based on Data, Emotion & User Research.

UI is Colors, Typography, & Layout.

UX is Wireframes, Site Map, & Personas.

For more information see this, well put blog: <http://blog.vengage.com/marketing>



THERE ARE TWO KINDS OF PEOPLE IN THIS WORLD

MENU

XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99

MENU

XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99
XXXXXXXXXX	99

TWO COLUMN EXAMPLE

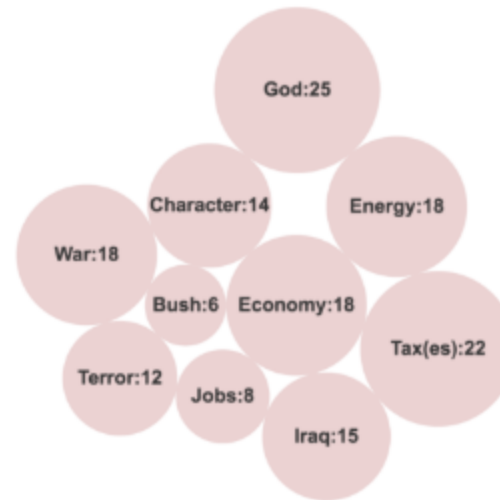
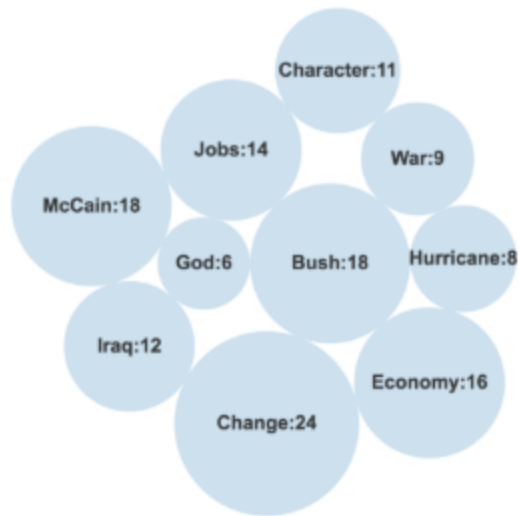
Who Said What?

Democrats



Number of times
words were used

Republican



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

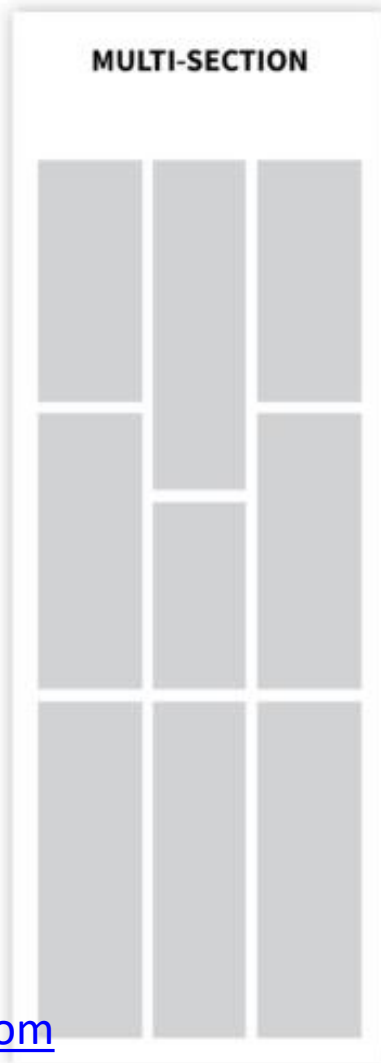
780 Million

people do not have access
to improved water sources

Every \$1

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

MULTI-SECTION LAYOUT FOR RANDOM VISUAL ACCESS



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

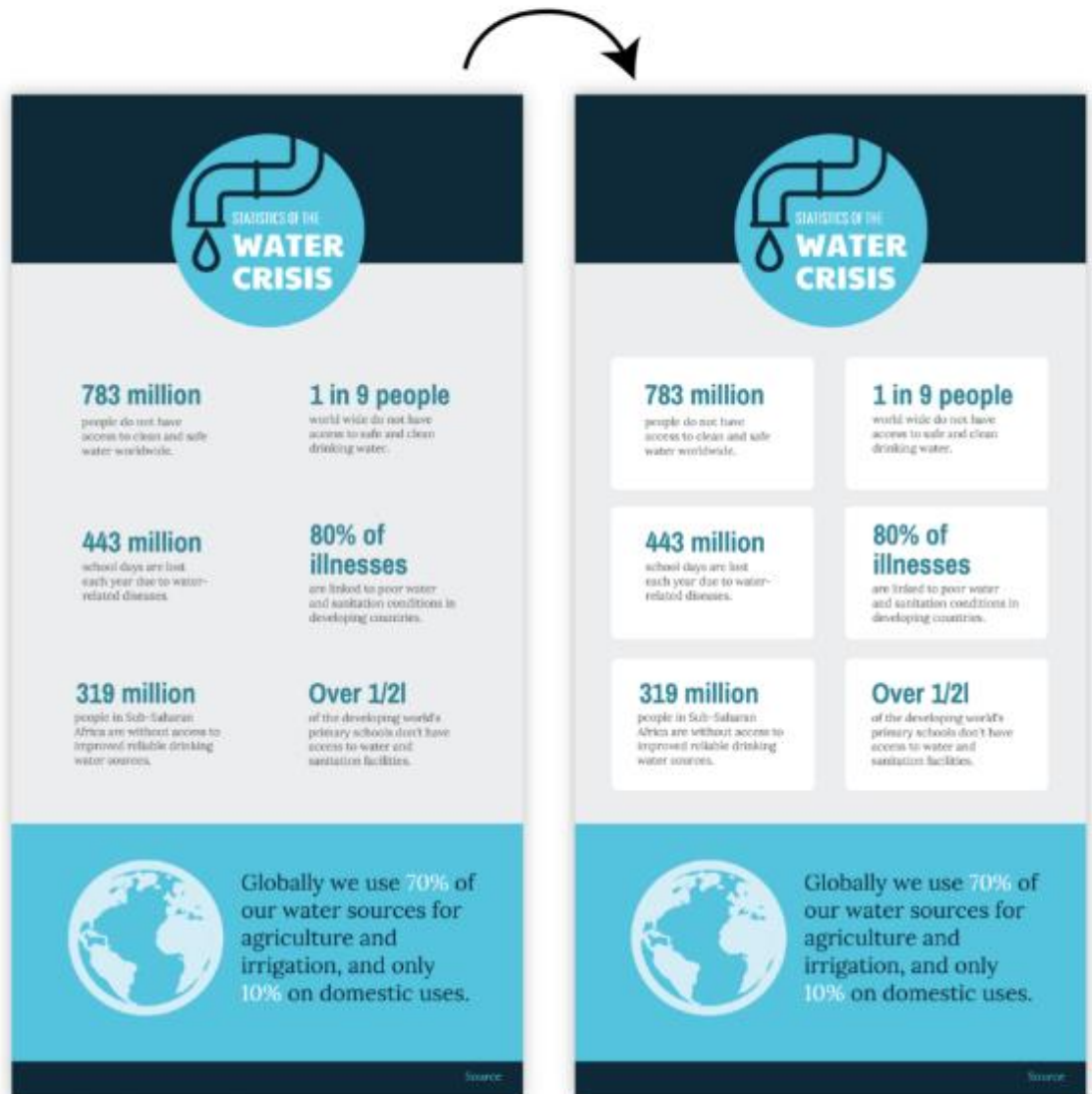
EXAMPLE

The image displays three sequential versions of a social media advertisement, connected by curved arrows indicating a progression from left to right. Each version features a black and white photograph of a bus with the number '1 1321' and a red silhouette of the state of Georgia on its side. Below the bus, a person is lying on the ground. The text and button elements below the image vary across the three versions:

- Version 1 (Left):** The text 'Reducing Poverty' is in a small font. The body text is also small. The button text is 'Find out how you can make an impact today'.
- Version 2 (Middle):** The text 'Reducing Poverty' is in a medium font. The body text is also medium-sized. The button text is 'Find out how you can make an impact today'.
- Version 3 (Right):** The text 'REDUCING POVERTY' is in a large, bold font. The body text is also large. The button text is 'FIND OUT HOW YOU CAN MAKE AN IMPACT TODAY'.

REPETITION, CONSISTENCY, AND ALIGNMENT

Repeat basic shapes to reinforce the underlying grid



EMPHASIZE USING SHAPES

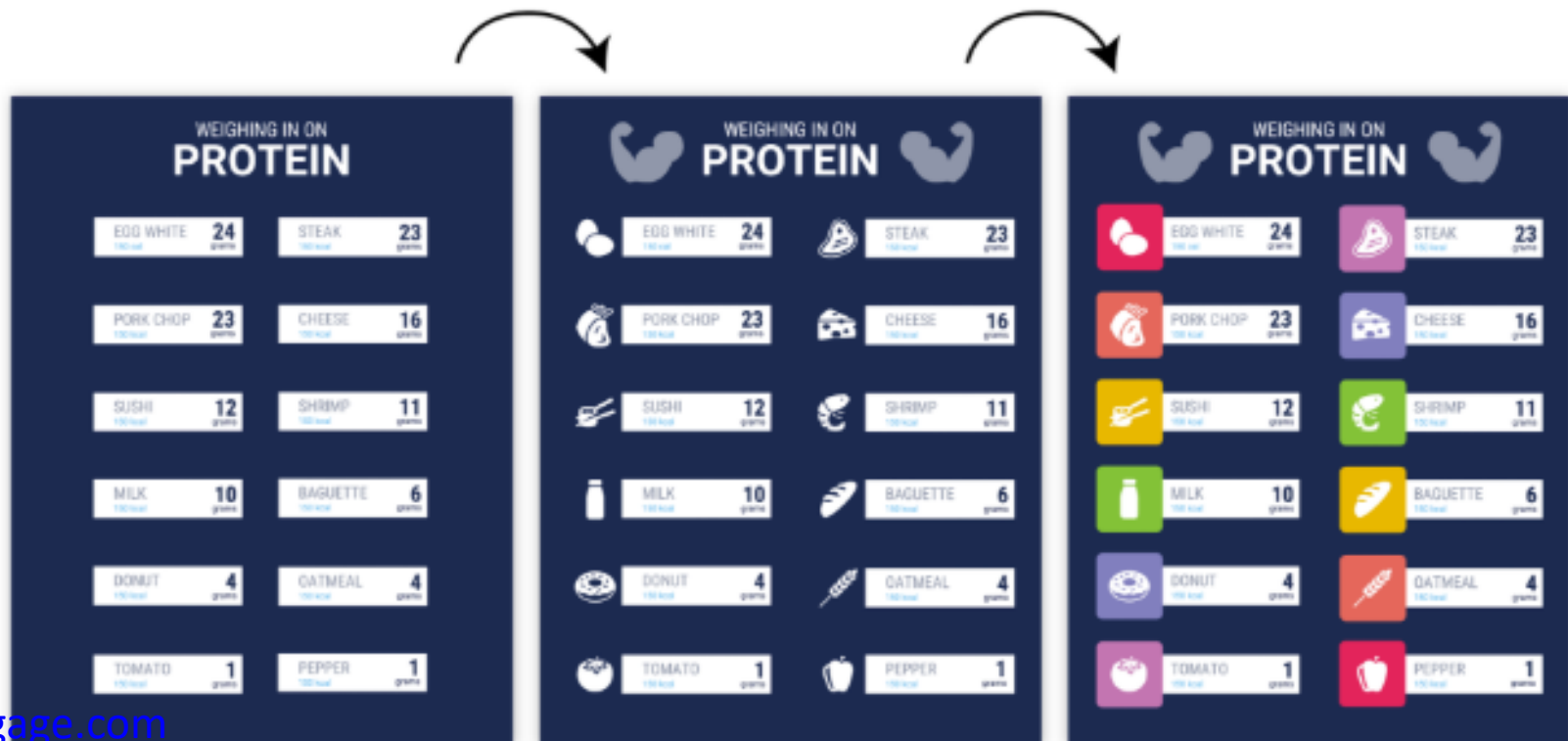
Use basic shapes to emphasize headers and list elements



USE ICONS

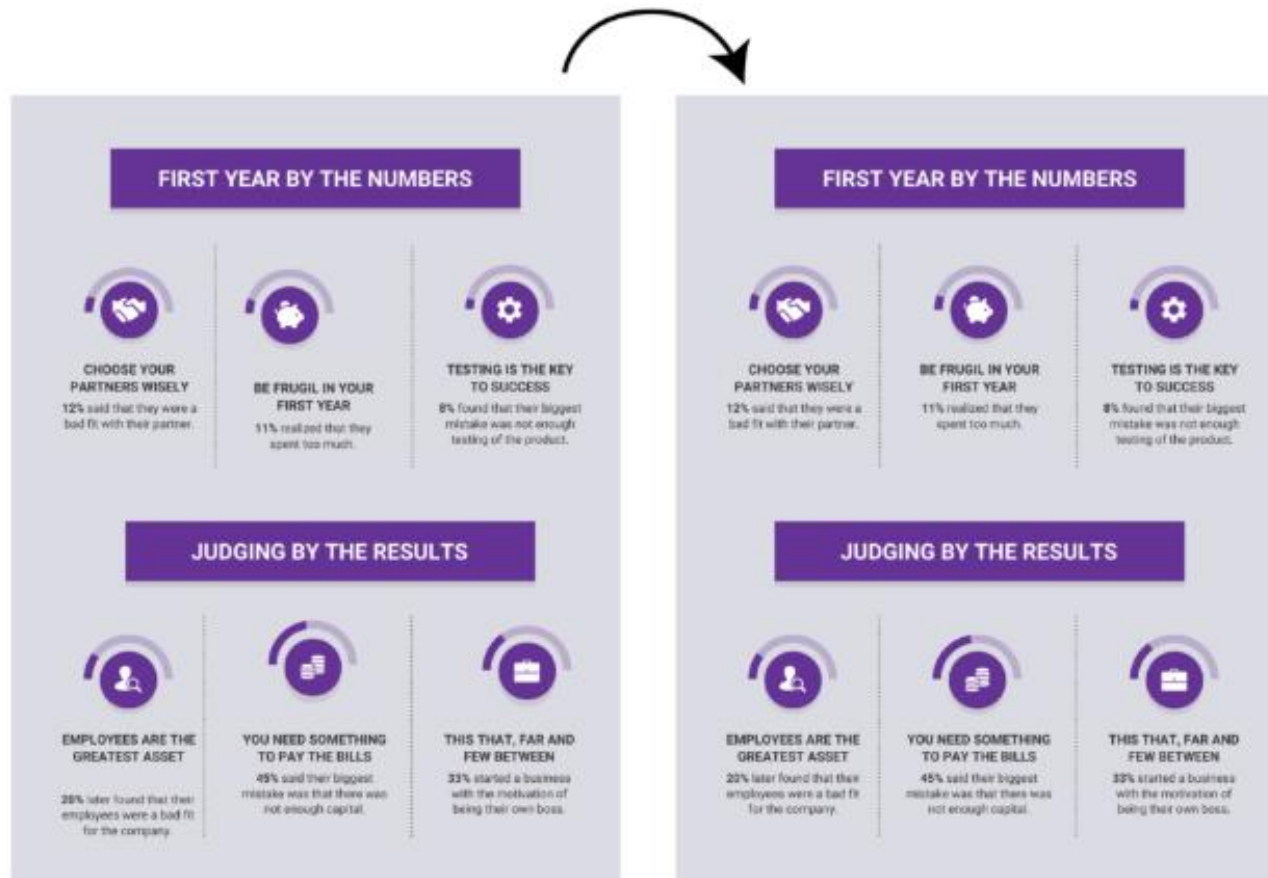
Add icons to reinforce important concepts in the text

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



BE DILIGENT

Make sure the repeated elements you add are aligned!



NEGATIVE SPACE

Negative (white) space is often used in advertising

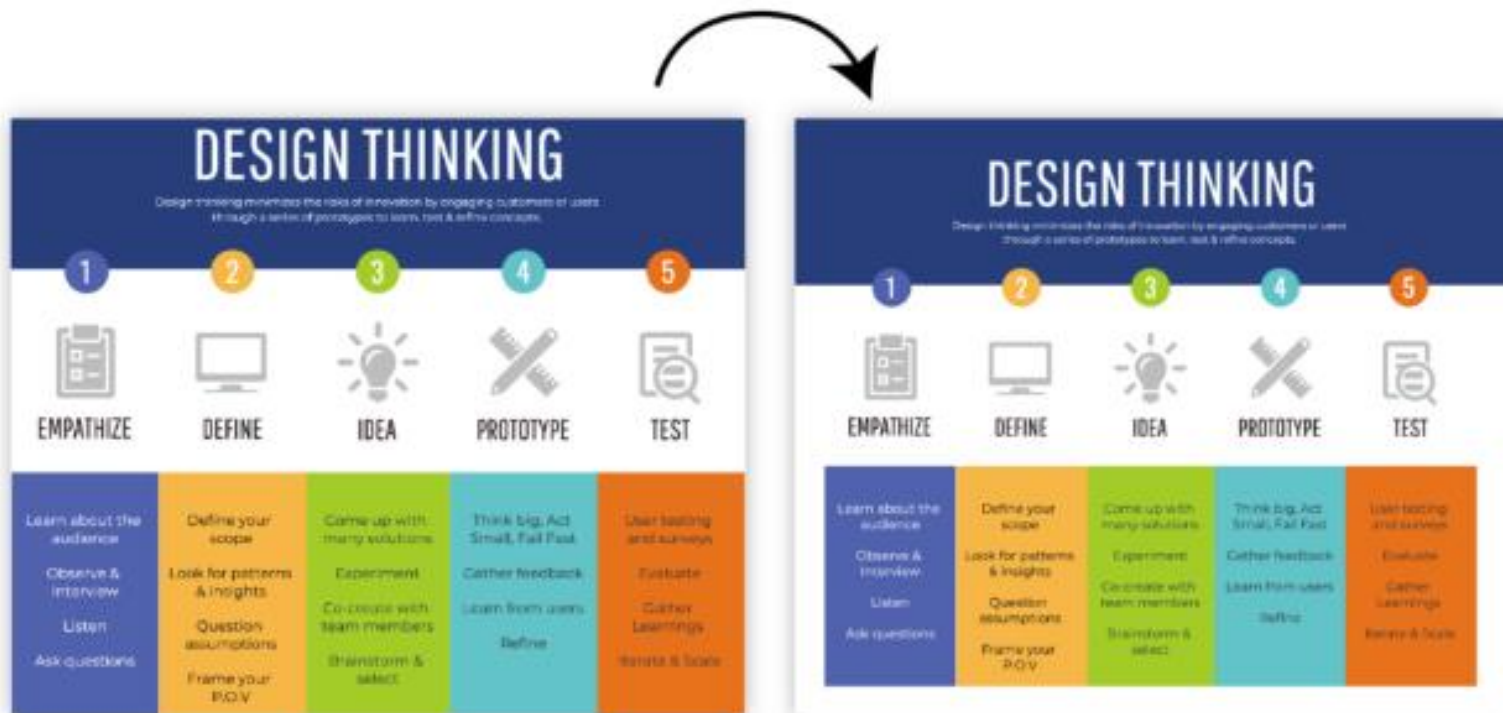
- the space around and between the subject of an image
- helps to define a subject
- helps emphasizing a message



NEGATIVE SPACE IN INFOGRAPICS

Just as important as any other element of a design


- simplest negative space are margins around the graphics



NEGATIVE SPACE: GAPS

Use gaps between unrelated elements

- makes it easier to immediately understand which elements are grouped together

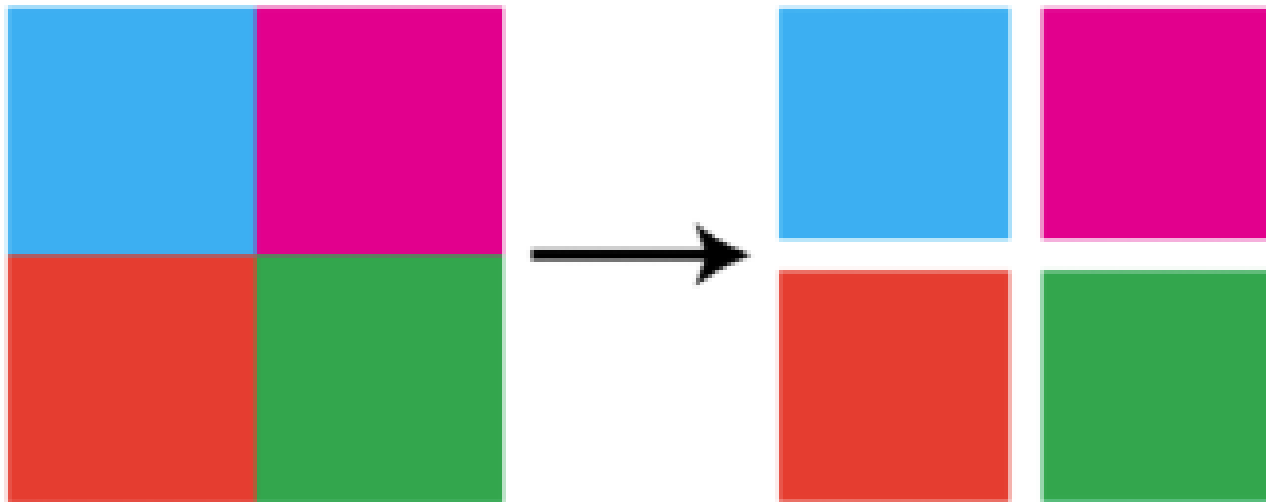


What kind of plan are you interested in?	Basic Basic features and perks	Premium Premium features and perks	Business Business features and perks
These are few options for you compare and decide from. <small>*All plans are monthly.</small>	\$14	\$20	\$35
Storage space	4GB	8GB	Unlimited
Validity	1 Year	1 Year	2 Years
Posts per month	4	8	Unlimited
Branding	No	No	Yes
Social Bookmarking	No	No	Yes
Tracking per month	50	100	Unlimited
Cloud Storage	4GB	8GB	Unlimited

What kind of plan are you interested in?	Basic Basic features and perks	Premium Premium features and perks	Business Business features and perks
These are few options for you compare and decide from. <small>*All plans are monthly.</small>	\$14	\$20	\$35
Storage space	4GB	8GB	Unlimited
Validity	1 Year	1 Year	2 Years
Posts per month	4	8	Unlimited
Branding	No	No	Yes
Social Bookmarking	No	No	Yes
Tracking per month	50	100	Unlimited
Cloud Storage	4GB	8GB	Unlimited

NEGATIVE SPACE: COLOR INTERACTION

Much easier to make colors play nicely with each other by adding a little whitespace



COLOR FOR HIGHLIGHTING

Use color to highlight important information



COLOR FOR GROUPING

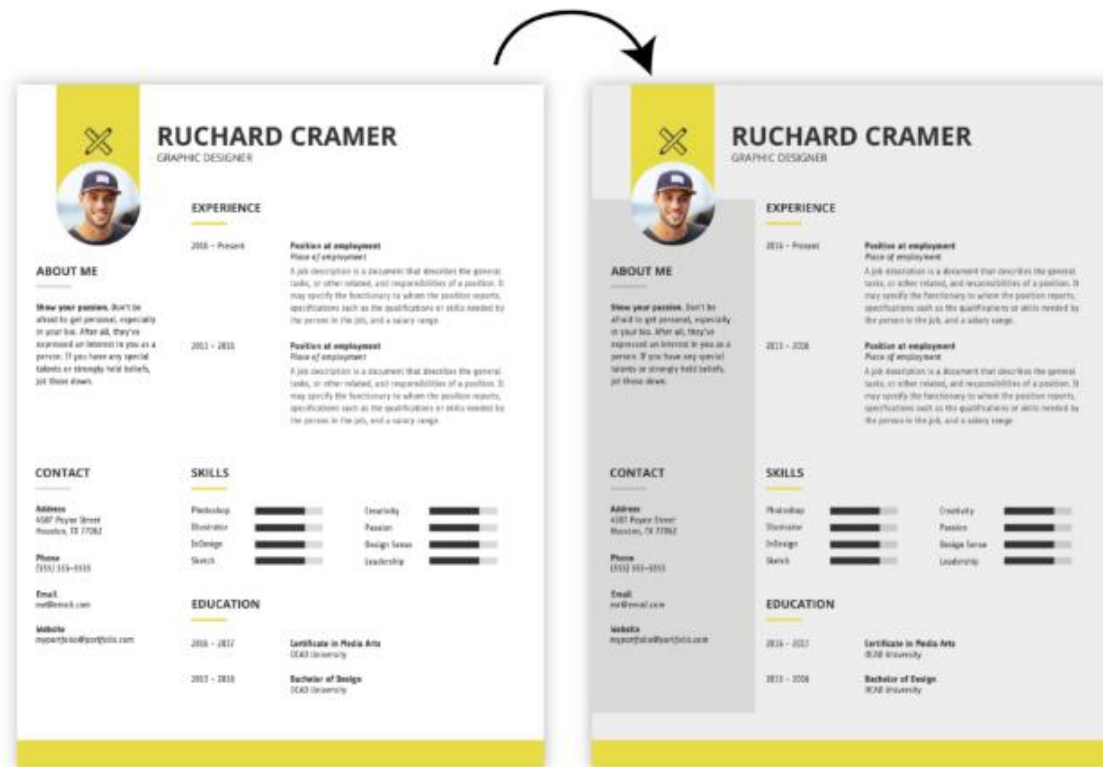
Use color to group related elements together



NEUTRAL COLORS

Use neutrals to offset bright colors

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



COLOR PALETTES

rich & polished



brilliant blues



baroque luxury



gracefully modern



sunny & warm



classic & trustworthy



THERE ARE TEMPLATES ON THE WEB

HOW BEST TO COMBINE CHARTS IN YOUR COMPOSITION

Change

HOW BEST TO COMBINE CHARTS IN YOUR COMPOSITION

INTERMEDIATE CHART TYPES

Instagram tips and tricks

#1 **Hashtags**
Use your own unique hashtags to help you stand out from the crowd.

#2 **Member Spotlight**
Post a photo of a member of your team or a customer who has helped you grow your business.

#3 **Weekly Message**
Post a message from your business every week to help you stay on top of your customers.

#4 **Go Live**
Post a video of your business in action to help you stay on top of your customers.

INTERMEDIATE HOW TO USE INSTAGRA...

espresso
A strong black coffee made by forcing hot water through finely-ground coffee beans.

cappuccino
The highly popular coffee drink is made with equal parts of espresso, steamed milk and milk foam.

americano
A single shot of espresso topped with a splash of hot water. Many coffee houses have a "short" or "tall" version of this drink.

caffè latte
A popular drink in America, the caffè latte is made with equal parts of espresso and steamed milk, topped with foam.

caf mocha
This is a combination of a coffee with chocolate sauce or powder added. It is topped with whipped cream.

caf au lait
This traditional French drink is similar to a coffee with steamed milk. It is made with equal parts of espresso and a ratio with steamed milk.

BEGINNER COFFEE GUIDE

1 Space Launch Now
Space Launch Now is a collection of all the upcoming launches, along with details and a link to the provider of the launch where applicable. You can also track the progress of the launch and see the status of the launch.

2 CineTrak
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

3 UVLens
The app tells you the UV index level and throughout the day so you can plan your activities accordingly. It also has a feature that tells you when you should wear your sunglasses.

4 Runtastic
This is a collection of apps for tracking your runs and walks. You can also see the status of the launch and see the status of the launch.

BEGINNER 5 APPS

PHONE APPS
For iPhones

1 Clips
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

2 Moleskine Timepage
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

3 Bear
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

4 Word Flow
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

5 RunGo
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

6 Signal
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

7 Eik
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

8 Ollist
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

9 Down To Lunch
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

10 Carrot Weather
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

BEGINNER 10 APPLE APPS

BUSINESS

JOB SEARCH TIPS TO USE IN 2018

1 A.I. Won't Find You a Job
Start may help so that if you are interested, it is not likely to increase your chances of landing the job. It is a job that is not likely to be found by a search engine.

2 Outside-The-Box?
Waking up, entrepreneurial ventures, and all sorts of great ways to give your job experience and skills.

3 Stay Engaged
The modern job seeker remains, particularly engaged in the job search in a market that is not likely to be found by a search engine.

INTERMEDIATE JOB SEARCH TIPS INFOGR...

PREMIUM

5 STRATEGIES FOR VIRAL & EVERGREEN CONTENT

WHAT IS VIRAL CONTENT?
Viral content is content shared widely from one user to another. It is often highly and organically shared. It is often highly and organically shared.

ENTERTAINING CREATIVE VALUABLE ENGAGING

1 SOLVE A BURNING PROBLEM
This is a collection of apps for downloading and tracking movie trailers. You can also see the status of the launch and see the status of the launch.

2

INTERMEDIATE 5 STRATEGIES FOR VIRAL ...

HOW TO MAKE A BRAND STYLE GUIDE LIKE THESE TOP TECH COMPANIES

When it comes to branding, consistency is everything!
Use a brand style guide to define everything that matters to your brand, from typography and color to logos and imagery.

DO YOUR BRAND STYLE GUIDE WITH A GREAT BRAND STORY

BEER, BIKER, GOLF FAN?

the World according to Seiya

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