

# **Writing Effective Alternative Text for Educational Content:**

**Best Practices for Reducing Cognitive Load**

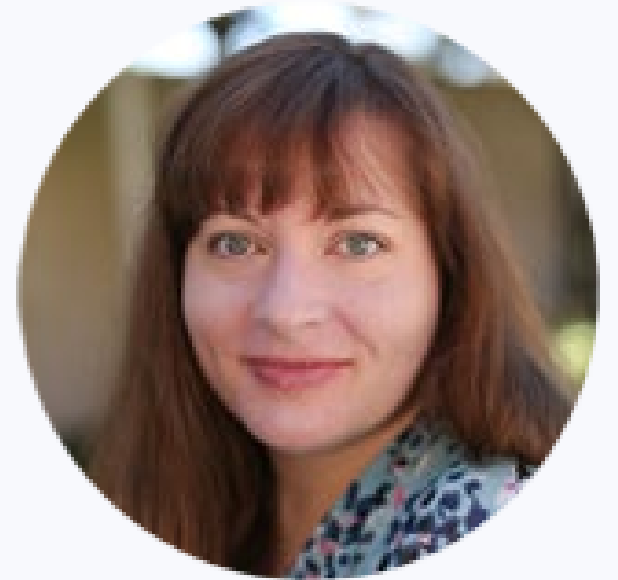
**Presented by Valerie Morrison, Ph.D.  
Research by K. James Monroe**

**CREATING THE NEXT®**

# Today's Presenter

## **Valerie Morrison, Ph.D., E-Text Manager at CIDI**

Valerie manages the E-Text department, making accessible textbooks for students with print-related disabilities. Valerie earned her doctorate in English Literature. Now she provides educational materials to all students, finding new ways to transform course materials into accessible digital formats.



# Presentation Goals

## THE ANATOMY OF SPEED

Virtually every part of a cheetah's body contributes to the cat's undisputed title of fastest land animal. On the hunt, the ultimate sprinter accelerates to 60-plus miles an hour in three seconds, with bones, muscles, and major organs collaborating in a symphony of speed.

### Balance and steering

If pursued prey shifts direction, a cheetah turns just as quickly, aided by a tail that acts like a rudder.

### Back and front legs

Long, slender bones increase stride yet can take high-speed impact. The way muscle connects to bone at each joint lets the cat quickly kick into high gear.

### Propulsive spine

A strongly muscled and hyperflexible spine helps a galloping cheetah reach strides that can surpass 25 feet. For half that length, the cat is airborne.

### Maximum air intake

Large sinuses and nasal passages fill much of the skull. The trade-off: smaller jaws and teeth. Cheetahs kill with a suffocating throat hold rather than a spine-severing bite.

### Oxygen delivery

Oversize lungs and a large heart take in and distribute the enormous amounts of oxygen needed to fuel top speed.

### Front legs

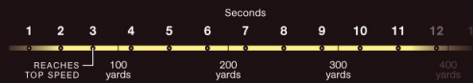
Upper leg muscles attach to shoulder blades in a way that lengthens stride. Muscle, not collarbone, links shoulder blades, enhancing flexibility. Claws, never fully retracted, dig in for traction.

### TOP SPEED OF FIVE LAND ANIMALS



### THE CHASE

Top speed, reached in three seconds, can be sustained for 300 to 450 yards. Exhausted, the cat must rest 15 minutes or longer.



JASON TREAT, NDM STAFF; ART: BRYAN CHRISTIE. SOURCES: KRISTOFER M. HELGEN, MATTHEW W. TOCHERI, E. GRACE VEATCH, KATHRYN J. MCGRATH, NATIONAL MUSEUM OF NATURAL HISTORY, SMITHSONIAN INSTITUTION, PENNY HUDSON, ROYAL VETERINARY COLLEGE

1. My Work with Alternative Text
2. Concept of Cognitive Load
3. Examples of Educational and STEM Content

# Alternative Text

# E-Text Products and Services



- Accessible PDF
- Microsoft Word DOC
- EPUB
- DAISY
- HTML
- Accessible Math
- Enhanced Tagged PDF
- PowerPoint

# Who Needs Alt Text?

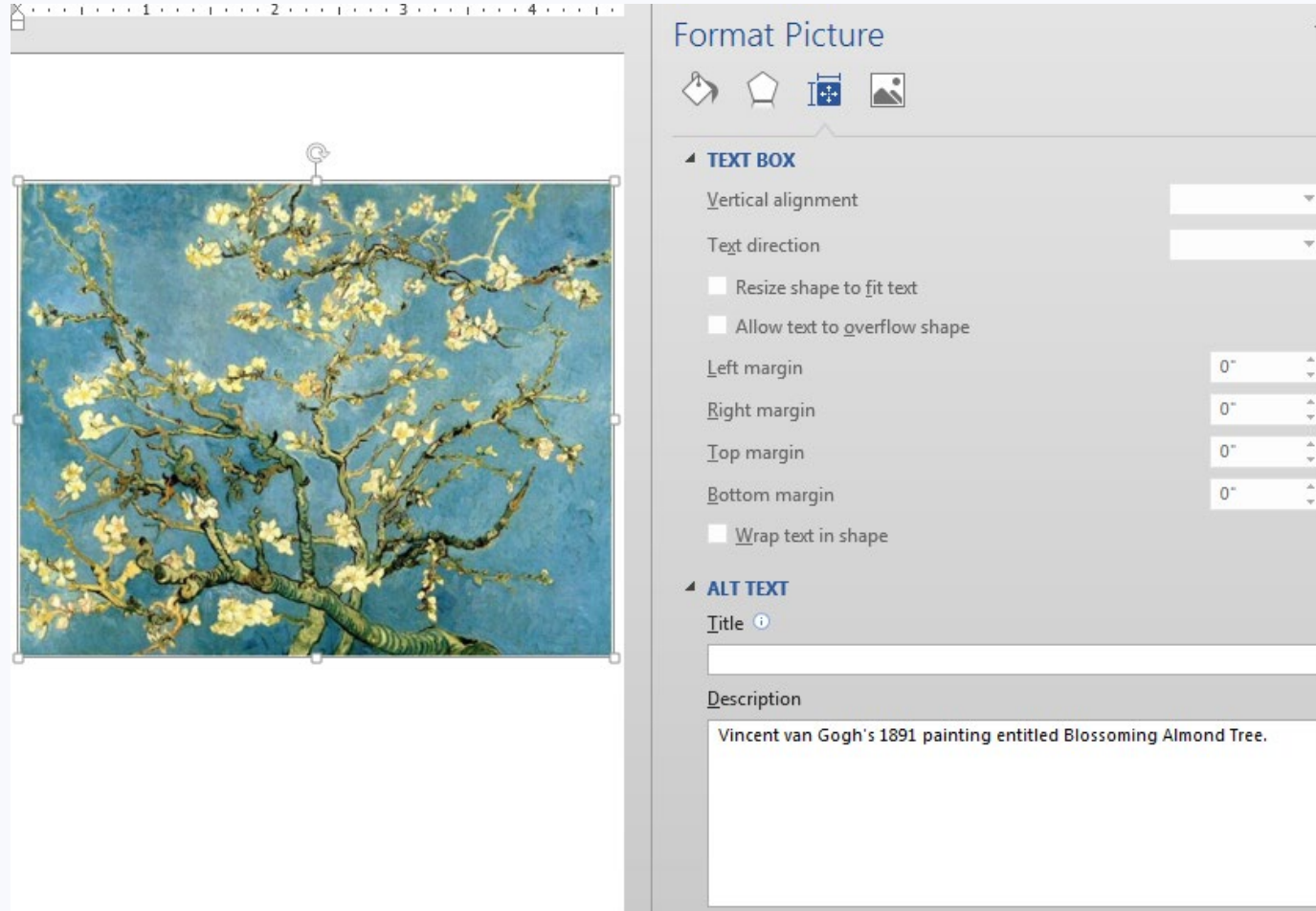
- Individuals who are blind, or experience color blindness or low vision
- Individuals with learning disabilities such as dyslexia, dyscalculia, dysgraphia, or ADHD
- Individuals with head injuries, trauma, or cognitive disabilities
- Auditory learners
- Aging population
- Everyone



# Alternative Text Descriptions

Images should be described using proper capitalization, grammar, and punctuation.

- Right click on the image and select Edit Alt Text.
- Type in the Description field.
- In older versions of Office, right click on the image and choose Format Picture. Select the Layout Properties icon. Click on the Alt Text link.





# How to Approach Image Description

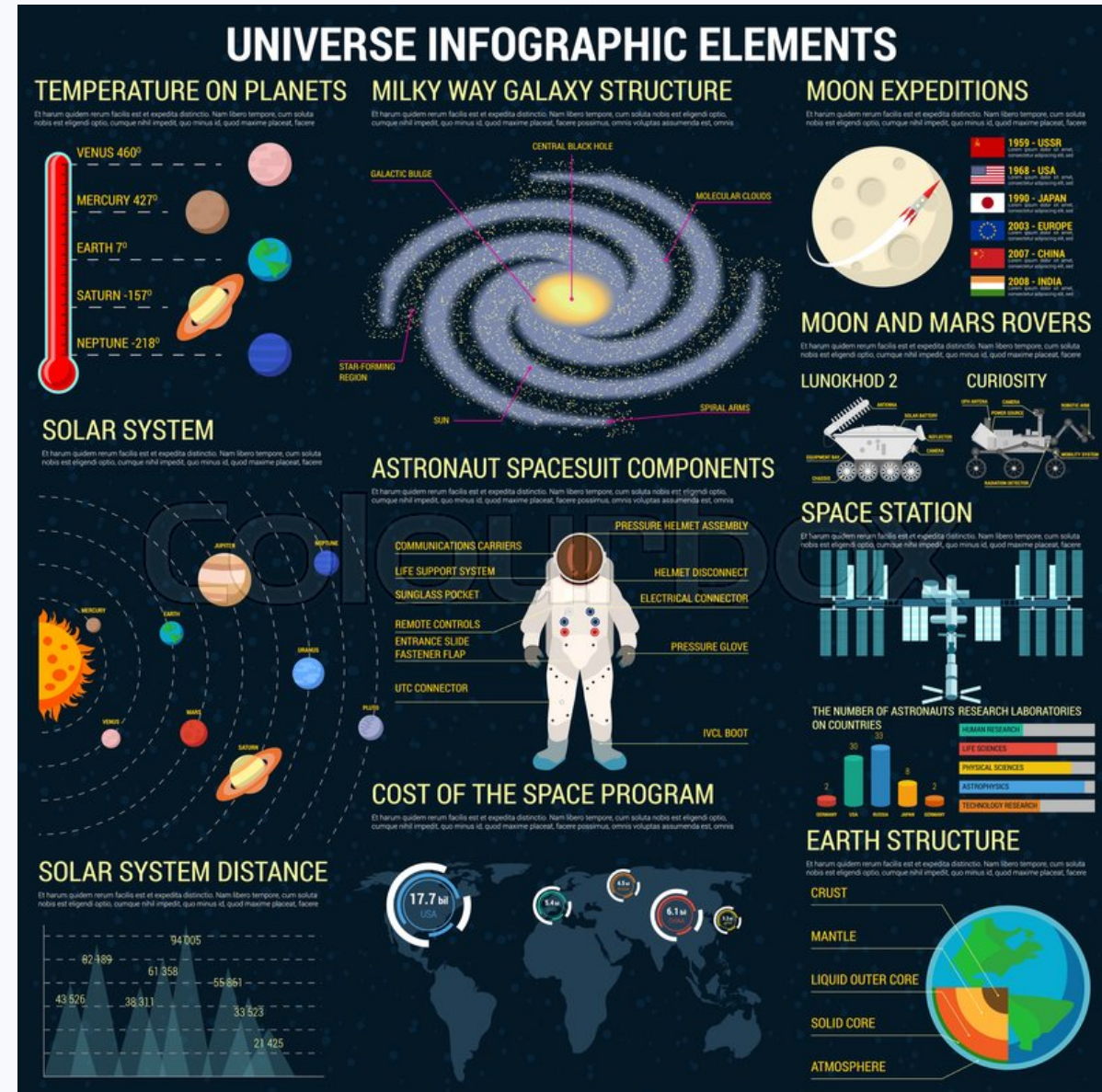
- First summarize what you see in one general informative sentence.
- Keep your description neutral and informative.
- Use proper grammar, spelling and punctuation.
- Avoid acronyms and symbols.



# Cognitive Load

# Consider Cognitive Load

- Try to avoid causing Auditory Fatigue when describing complex images.
- Learning is enhanced when you reduce the number of items stored in the working memory.
- Alt text is most effective when it's as concise as possible and organized efficiently with items grouped for easier mental processing.



# Use Clear and Concise Syntax

- Edit for clarity
- Simplify word choice
- Use parallel structure
- Spell out acronyms or symbols

# Organize Information

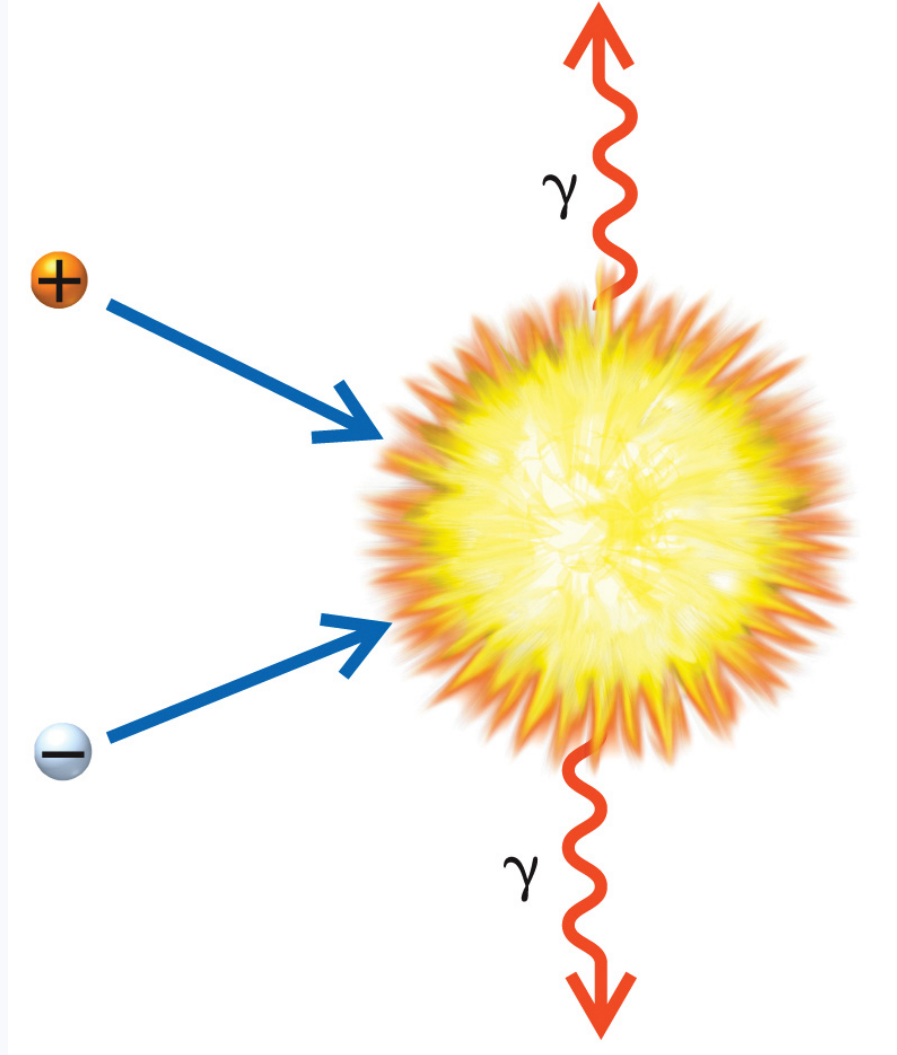
- Work from general to specific to provide a framework
- Group like items and describe relationships
- Describe images by their similarities first, differences second
- Organize information in predictable ways

# Reduce Redundancies

- Avoid repeating what is in a caption or the surrounding text
- Edit your description if it becomes wordy
- Integrate symbols or labels into your description, meaning describe the function of symbols, not the appearance of them

# Focus on Meaning

- Avoid the common mistake of spending your time describing the **appearance** of symbols rather than their **meaning**.
- Example: In this image, you would want to avoid describing “a ball labeled with a plus sign” and instead you should call it “a positron.” Avoid describing “a squiggly arrow labeled with a weird  $\gamma$ ” and instead call it “a gamma ray.”



# The Result?

- Reduce simultaneous mental tasks in working memory
- Increase ability to focus on new concepts
- Eliminate misunderstandings or confusion
- Decrease time and energy needed for understanding
- Allow for integration of new concepts into a mental model

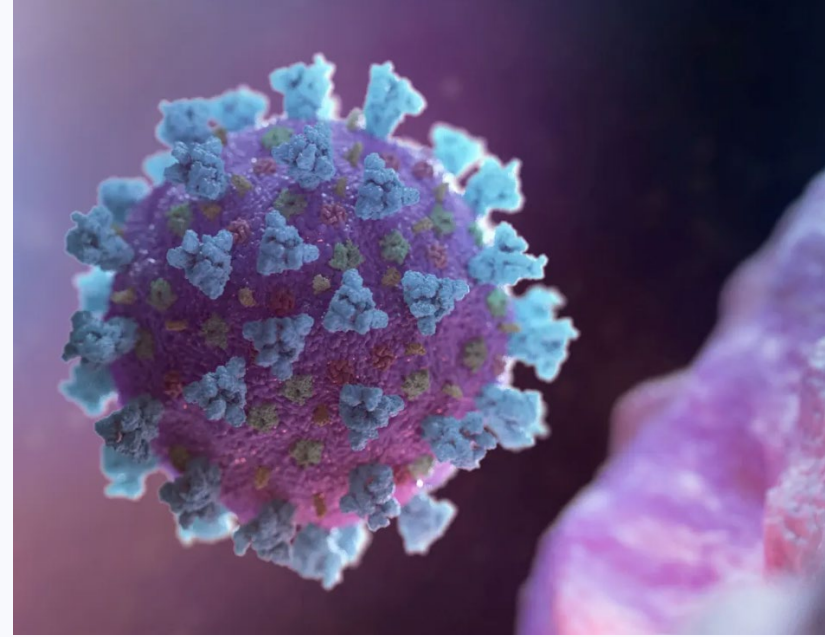


# **Educational and STEM Content**

# Simple Images



Photographs of people  
just need a name:  
Martin Luther King, Jr.

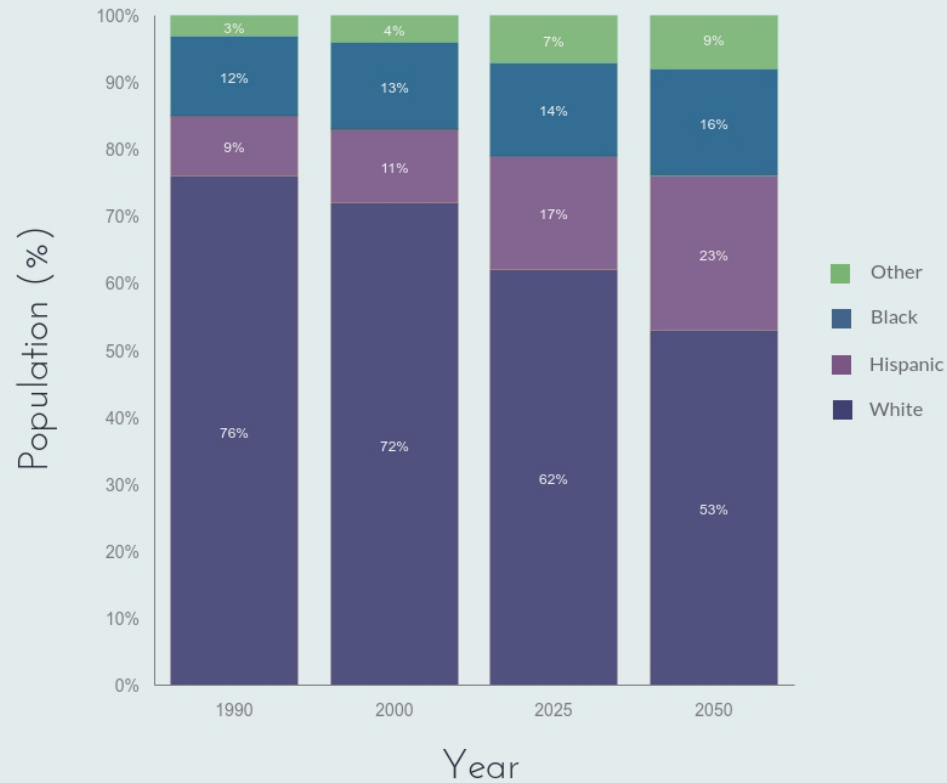


Simple graphics can often be described in one sentence: A magnified image of the human coronavirus.

Additional details about its spherical structure and the projecting glycoproteins could be added depending on your audience and context.

# Bar Graphs

## U.S. Population by Race



Source: <http://www.originlab.com/doc/Tutorials/StackColumn-Labels>



Work from general to specific. Begin by naming the type of graph and title. Then describe the horizontal and vertical axes if applicable. Finally, describe the data.

A bar graph titled U.S. Population by Race that compares the percentages of Black, Hispanic, White, and Other races in the United States for the years 1990, 2000, projected 2025, and projected 2050. In 1990, there were 76% White, 9% Hispanic, 12% Black, and 3% Other. In 2000, there were...

# Line Graphs

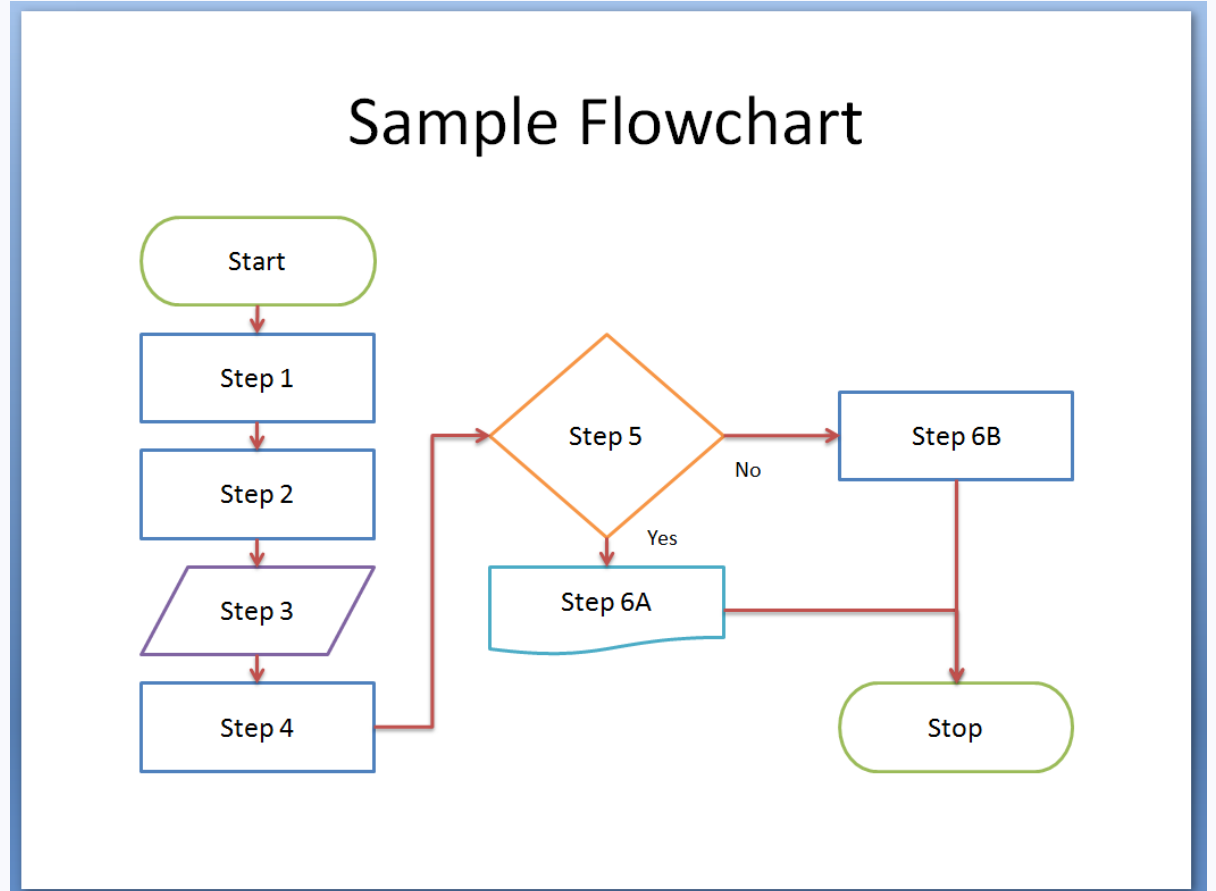
- Include title of graph and X-axis and Y-axis labels and ranges
- Summarize trends of lines, not every data point
- If every data point is needed, consider converting graph into table format
- If there is a noticeable change in slope then describe beginning and end point of that variation



# Flow Charts

Often flow charts can be reproduced easily in list format, either as numbered options, or in text form like the example below:

This sample flowchart begins with Start, then Step 1, Step 2, Step 3, Step 4, and Step 5. If yes, proceed from Step 5 to Step 6A and Stop. If no, proceed to Step 6B and Stop.

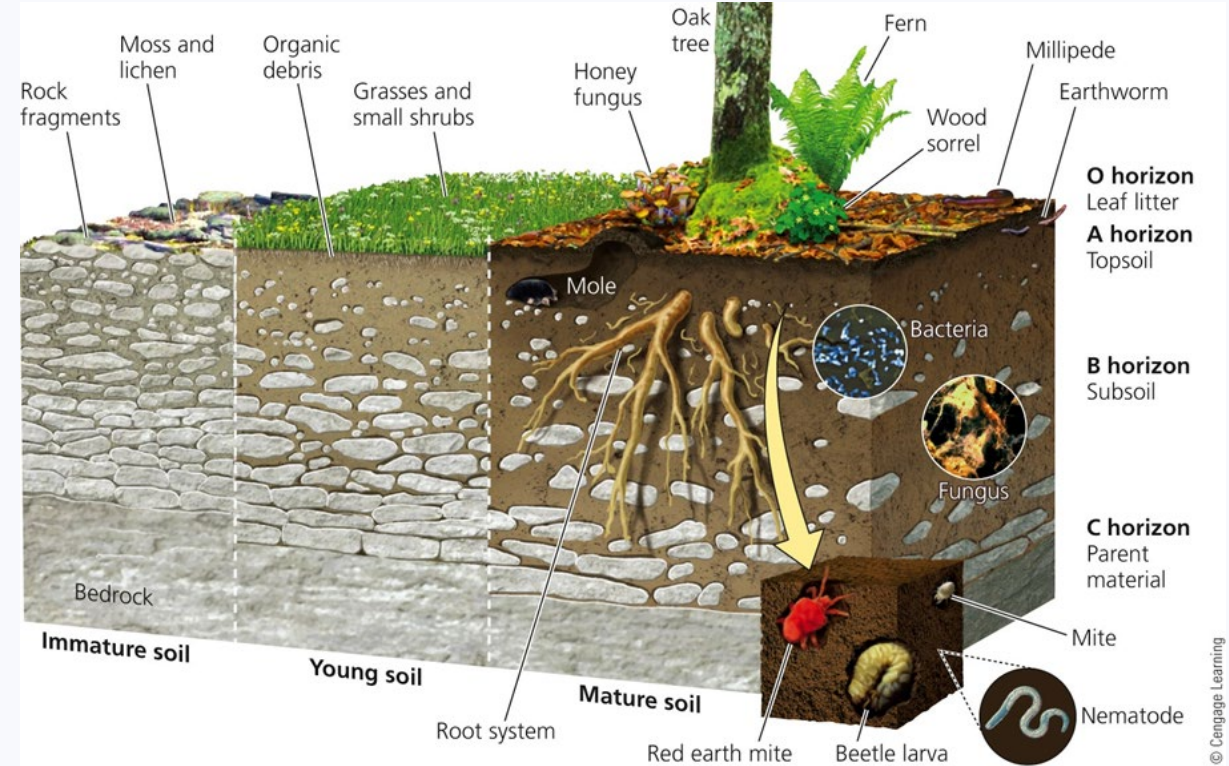




# Complex Diagrams

**Brief:** A diagram showing a cutout of soil formation in three stages: immature, young, and mature.

**Complex:** A diagram showing a cutout of soil formation in three different stages. Immature soil includes a large layer of bedrock at the bottom, large rocks throughout the rest of the ground, and rock fragments near the surface. Moss and lichen can grow on this soil. Young soil has a smaller layer of bedrock at the bottom, fewer large stones above it, and organic debris near the surface. Grasses and small shrubs can grow on this soil. Mature soil has an even smaller bedrock layer called the C horizon parent material followed by the B horizon subsoil, followed by the A horizon topsoil, and lastly the O horizon leaf litter. Throughout the soil there are root systems, moles, bacteria, fungus, beetle larva, red earth mites, nematodes, and earthworms. On the surface there are honey fungus, oak trees, ferns, wood sorrels, and millipedes.



# Maps

Describe the areas, regions, and relevant details on the map plus any inset. Often the colors, shapes, or arrows on a map have no significance.

A map of oceanic exploration routes by Dias and de Gama circa 1500, during the reign of the Holy Roman Empire in Europe and the Ottoman Empire in northern Africa and the Middle East. Dias' route begins in Portugal and hugs the western coast of Africa, ending at the Cape of Good Hope. The route for de Gama also begins in Portugal, goes around the Cape of Good Hope, hugs the eastern coast of Africa, and crosses the Indian Ocean ending in India.





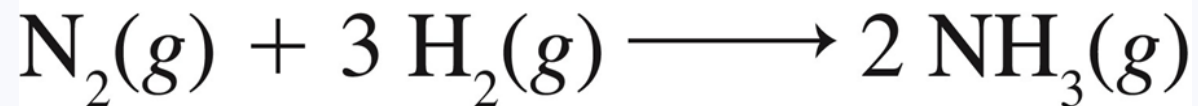


# Math and Chemistry Equations

$$t = \frac{(325 - 286) - 0}{\sqrt{\frac{(40)^2}{12} + \frac{(44)^2}{12}}} = 2.27$$

Brief: An equation.

Complex: Begin equation. T equals start fraction left parenthesis 325 minus 286 right parenthesis minus 0 over start root start fraction left parenthesis 40 right parenthesis squared over 12 end fraction plus start fraction left parenthesis 44 right parenthesis squared over 12 end fraction end root end fraction equals 2.27. End equation.



Brief: A chemical equation.

Complex: Begin equation. Gaseous Upper N 2 plus 3 gaseous Upper H 2 yields 2 gaseous Upper N Upper H 3. End equation.

# Infographics and Tables

## The Mission

CloudSat is an Earth-orbiting satellite that will use radar to study clouds from space. It will be able to see inside the clouds from top to bottom, measuring their thickness, their altitude at top and bottom, their reflective properties, and their water and ice content. Data from CloudSat will be used to improve our ability to accurately forecast the weather and improve long-term global climate predictions.

## Reading the Clouds

Clouds, which are collections of water droplets, are beautiful and fun to watch. If we learn to "read" them, we can know what is happening at different levels of the atmosphere and what kind of weather may be on the way. Clouds are classified by their shape or appearance and their height above the ground.

**High clouds** start above around 6,000 meters (20,000 feet). They often look thin and patchy or feathery. Their names start with "cirro," which means "curl of hair" in Latin:

**Cirrus** clouds look like delicate strands or hooks. They are made mostly of ice crystals.

**Cirrocumulus** are thin, patchy clouds that may have rippled or wavelike patterns.

**Cirrostratus** are thin, sheet-like clouds that cover most of the sky.

**Mid-level clouds** form from 2,000 meters (6,500 feet) to 6,000 meters (20,000 feet). They usually look rather flat and layered, because the air at these altitudes doesn't move very much vertically. Their names always start with "alto":

**Altostratus** are white or gray puffy, patchy clouds with spaces between them. They may appear to be lined up in rows.

**Altostratus** form a gray or bluish-gray uniform-looking layer that covers much or most of the sky.

**Low-level clouds** are found below about 2,000 meters (6,500 feet). They are either flat and layered or rounded on top, with flat bases:

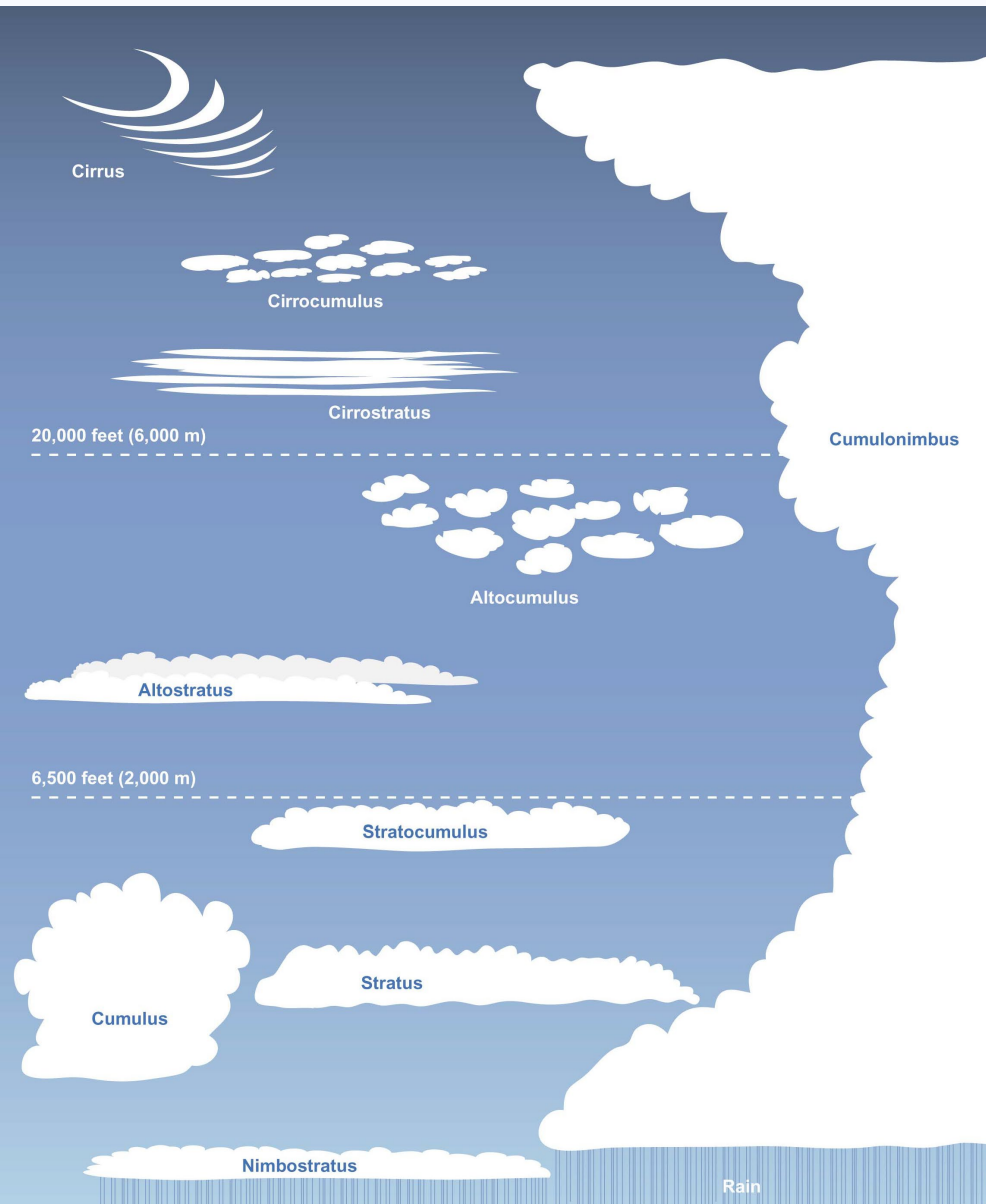
**Stratocumulus** have distinct gray or whitish rounded patches. They may look rolling or puffy, but are often merged together into layers with no spaces between them.

**Cumulus** clouds are fluffy and cauliflower-like, with rounded white tops and flat grayish bases.

**Stratus** form a flat, thin, uniform cloud layer. They usually contain insufficient water to produce significant rain or snow. Stratus clouds that reach down to the ground we call fog.

**Nimbostratus** are dark, gray clouds that are dropping rain or snow. They usually cover the entire sky. Sometimes nimbostratus are found higher in the atmosphere, in the mid-altitudes.

**Cumulonimbus** clouds are the kings of all clouds, rising from low altitudes up to more than 12,000 meters (40,000 feet). They grow due to rising air currents called updrafts, with their tops flattening out into an anvil shape. Cumulonimbus are a sure sign of severe weather, with heavy rain and possibly hail.



- Paragraph format removes the ease of comparison, which is available to sighted users by means of visual grouping.
- Instead, sort the information into a table.



# Converting Graphics to Table Form

Amino Acid	Symbol	DNA Codons
Alanine	A	GCA; GCC; GCG; GCT
Cystenine	C	TGC; TGT
Aspartic Acid	D	GAC; GAT
Glutamic Acid	E	GAA; GAG
Phenylalanine	F	TTC; TTT
Glycine	G	GGA; GGC; GGG; GGT
Histidine	H	CAC; CAT
Isoleucine	I	ATA; ATC; ATT
Lysine	K	AAA; AAG
Leucine	L	CTA; CTC; CTG; CTT; TTA; TTG
Methionine (START)	M	ATG
Asparagine	N	AAC; AAT
Proline	P	CCA; CCC; CCG; CCT
Glutamine	O	CAA; CAG
Arginine	R	AGA; AGG; CGA; CGC; CGG; CGT
Serine	S	AGC; AGT; TCA; TCC; TCG; TCT
Threonine	T	ACA; ACC; ACG; ACT
Valine	V	GTA; GTC; GTG; GTT
Tryptophan	W	TGG
Tyrosine	Y	TAC; TAT
STOP	*	TAA; TAG; TGA

- Providing this data in table form allows someone to tab through each column.
- A title and table caption placed before the table would allow someone to decide if they need to listen to this data.

# Structural Alt Text for Tables

Consider adding structural alt text to tables. This allows someone to hear what the table contains before listening to all the data.

Table 10.1 is titled Physical Properties of the Giant Planets. It has 5 columns and 13 rows. The column headings are Physical Property, Jupiter, Saturn, Uranus, and Neptune.

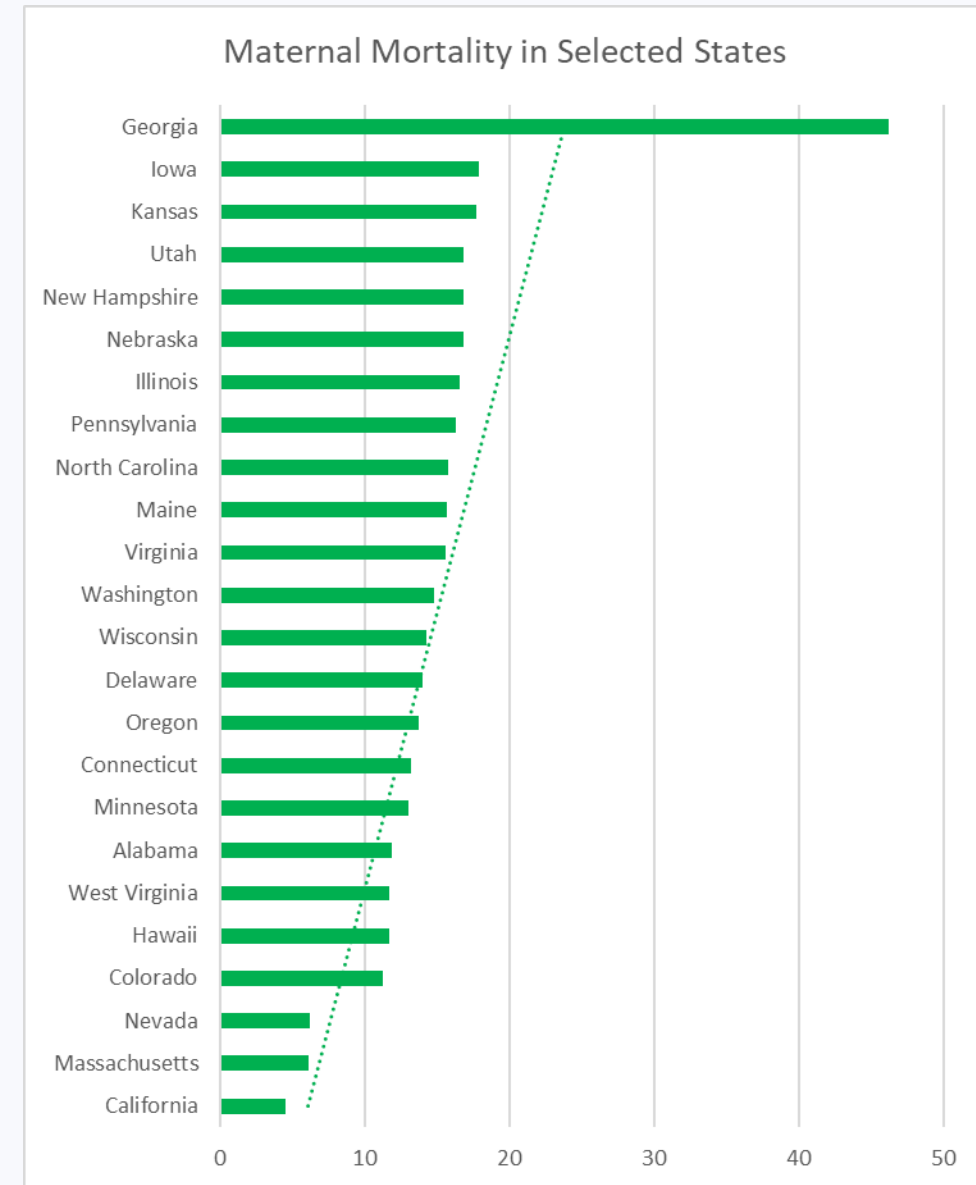
**TABLE 10.1**

**Physical Properties  
of the Giant Planets**

	Jupiter	Saturn	Uranus	Neptune
Orbital semimajor axis (AU)	5.20	9.6	19.2	30
Orbital period (Earth years)	11.9	29.5	84.0	164.8
Orbital velocity (km/s)	13.1	9.7	6.8	5.4
Mass ( $M_{\text{Earth}} = 1$ )	317.8	95	14.5	17.1
Equatorial radius (km)	71,490	60,270	25,560	24,300
Equatorial radius ( $R_{\text{Earth}} = 1$ )	11.2	9.5	4.0	3.8
Oblateness	0.065	0.098	0.023	0.017
Density (water = 1)	1.33	0.69	1.27	1.64
Rotation period (hours)	9.9	10.7	17.2	16.0
Tilt (degrees)	3.13	26.7	97.8	28.3
Surface gravity (relative to Earth's)	2.53	1.07	0.89	1.14
Escape speed (km/s)	59.5	35.5	21.3	23.5

# Implied Visual Information

- Charts and graphs are visualizations for a reason: to make implications. Leaving out the visual impression leaves out important information.
- Graphs should not be described solely by the raw data they offer but rather by what they are communicating.
- What is the visual impact of this graph?
- What relationships are implied here?



# Questions?