Basic Physical Science

Unit 1 2016

Day 1 of Basic PS!

1. QOD/Obj/Attendance
   - Complete Interest/Learning Profile Survey
2. Intro self – ppt
3. Build Community – Matrix
4. Expectations/Procedures
   - Video Clip – T-Chart
   - Syllabus (goldenrod packet)
5. Course Intro
   - Objectives and pacing guide (goldenrod packet)

Make a T-chart of appropriate and inappropriate behaviors from this clip.

What other behaviors can we add from our experience as students? Pet peeve in class?

Day 2 of Basic PS!

1. QOD/Obj/Attendance
2. Study Skills
   - What are they? LIST on board
   - Do you use them?
3. Fixed vs Growth Mindset
   - Video Clip
   - Word Sort
4. Effort
   - What is effort?
   - What does it look like?
   - How do you measure effort?
   - Rubric
5. HW: Safety Contract

Day 3 of Basic PS!

1. QOD/Obj/Attendance
2. Study Skills Inventory (as class)
   - Strengths? Weaknesses? Other epiphanies?
3. Goal Setting
   - Card Swap Activity: Describe your current study skills strengths (or goals) and how you plan to use them to be successful in Basic PS and beyond!! NO NAME ON CARD…
4. Three truths and a lie

1. I've seen Jay Z and Snoop Dogg in concert
2. My husband lost his wedding ring on our honeymoon
3. My oldest two kids were born in the same year
4. I have a tatoo

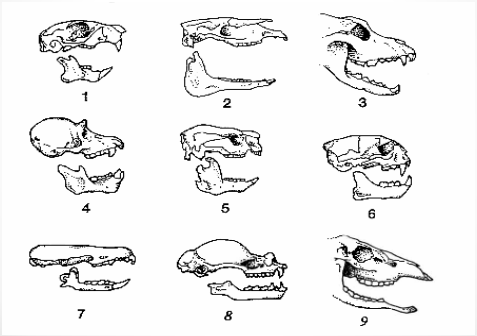
Day 4 of Basic PS!

1. QOD/Obj/Attendance
   - Write a possible quiz question and answer.
2. Questions before quiz? No? Take Quiz
   - Interests/Learning Profile
   - Syllabus/Objectives
   - Effort
   - Growth vs Fixed Mindset
   - Safety
   - Study Skills Inventory
   - Goal
   - Class Building
3. HW Check:
   a. Interest/Learning Profile
   b. Safety Contract
   c. Study Skills Inventory
   d. Goal

Nature of Science

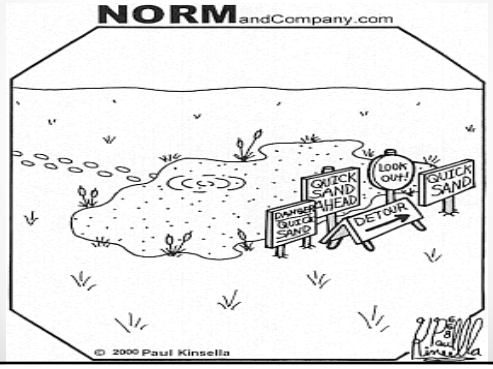
- Pure science aims to come to a common understanding of the universe…
- Scientists suspend judgment until they have a good reason to believe a claim to be true or false…
- Evidence can be obtained by observation or experimentation…
  - Observations followed by analysis and deduction…inference…(pic)
  - Experimentation in a controlled environment…

Observations vs. Inferences 1



Observations vs. Inferences 2

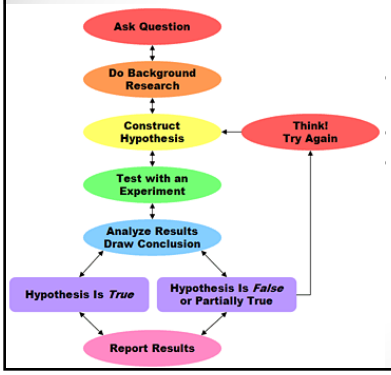
Observations vs. Inferences 3



Purpose of Evidence

- Evidence is used to develop theories, generalize data to form laws, and propose hypotheses.
- Theory – explanation of things or events based on knowledge gained from many observations and investigations
  - Can theories change? What about if you get the same results over and over?
- Law – a statement about what happens in nature and that seems to be true all the time
  - Tell you what will happen, but don't always explain why or how something happens
- Hypothesis – explanatory statement that could be true or false, and suggests a relationship between two factors.

Ch 1.2: Using a Scientific Approach, pg 7-11



- Set of investigation procedures
- General pattern
- May add new steps, repeat steps, or skip steps

Group Discussion Questions

- 1&6 – What is the scientific method and its goal?
- 2&7 – What is a hypothesis and how is it formed?
- 3&8 – What are the types of variables in a controlled experiment and how are they different?
- 4&9 – What is the difference between scientific theory and scientific law?
- 5&10 – What is a scientific model and how are they useful?

Bubble Gum Example

1. Problem/Question: How does bubble gum chewing time affect the bubble size?
2. Gather background info…
3. Hypothesis: The longer I chew the larger the bubble.
4. Experiment…
   1. Independent variable – chew time
   2. Dependent variable – bubble size
   3. Controlled variables – type of gum, person chewing, person measuring, etc.
5. Analyze data – 1 minute → 3 cm bubble, 3 minutes → 7 cm bubble…30 minutes → 5 cm…
6. Conclusion – there is an optimum length of chewing gum that yields the largest bubble
7. What next? Now try testing…

Systems of Measurement

- **We collect data two ways: Quantitative and Qualitative**
- **Why do we need a *standardized* system of measurement?**
  - **Scientific community is global.**
  - **An international "language" of measurement allows scientists to share, interpret, and compare experimental findings with other scientists, regardless of nationality or language barriers.**

Metric System & SI

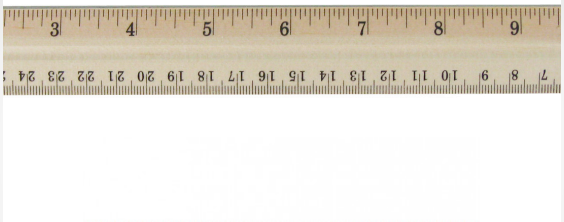
- **The first standardized system of measurement: the "Metric" system**
  - **Developed in France in 1791**
  - **Named based on French word for "measure"**
  - **based on the decimal (powers of 10)**
- ***Systeme International d'Unites* (International System of Units)**
  - **Modernized version of the Metric System**
  - **Abbreviated by the letters SI.**
  - **Established in 1960, at the 11th General Conference on Weights and Measures.**
  - **Units, definitions, and symbols were revised and simplified.**

SI Base Units

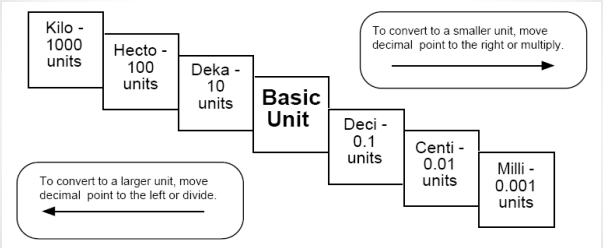
Physical Quantity	Unit Name	Symbol
length	meter	m
mass	kilogram	kg
time	second	s
volume	liters, meter cubed	L, m^3
temperature	Kelvin	K

SI Prefixes

Prefix	Symbol	Numerical Multiplier	Exponential Multiplier
giga	G	1,000,000,000	10^{9}
mega	M	1,000,000	10^{6}
kilo	k	1,000	10^{3}
hecto	h	100	10^{2}
deka	dk	10	10^{1}
no prefix means:		1	10^{0}
deci	d	0.1	10^{-1}
centi	c	0.01	10^{-2}
milli	m	0.001	10^{-3}
micro	μ	0.000001	10^{-6}
nano	n	0.000000001	10^{-9}



"Staircase" Method



Draw and label this staircase every time you need to use this method, or until you can do the conversions from memory

"Staircase" Method: Example

- **Problem: convert 6.5 kilometers to meters**
  - Start out on the "kilo" step.
  - To get to the meter (basic unit) step, we need to move three steps to the right.
  - Move the decimal in 6.5 three steps to the right
  - **Answer: 6500 m**

"Staircase" Method: Example

- **Problem: convert 114.55 cm to km**
  - Start out on the "centi" step
  - To get to the "kilo" step, move five steps to the left
  - Move the decimal in 114.55 five steps the left
  - **Answer: 0.0011455 km**

Big Fat Fractions

- Multiply original measurement by conversion factor, a fraction that relates the original unit and the desired unit.
  - Conversion factor is always equal to 1.
  - Numerator and denominator should be equivalent measurements.
- When measurement is multiplied by conversion factor, original units should cancel

BFF: Example

- **Convert 6.5 km to m**
- **First, we need to find a conversion factor that relates km and m.**
  - **We should know that 1 km and 1000 m are equivalent (there are 1000 m in 1 km)**
  - **We start with km, so km needs to cancel when we multiply. So, km needs to be in the denominator**

$$\frac{1000\ \text{m}}{1\ \text{km}}$$

BFF: Example

- Multiply original measurement by conversion factor and cancel units.

$$6.5\ \text{km} \times \frac{1000\ \text{m}}{1\ \text{km}} = 6500\ \text{m}$$

BFF: Example

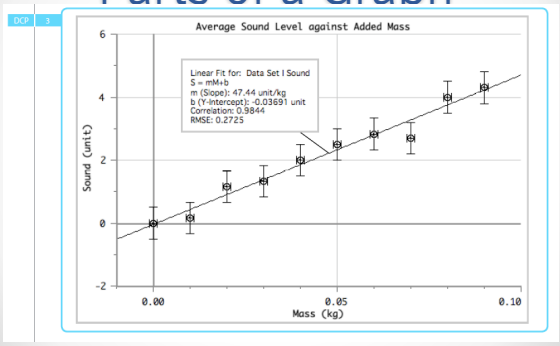
- Convert 3.5 hours to seconds
- If we don't know how many seconds are in an hour, we'll need more than one conversion factor in this problem

$$3.5\ \text{hours} \times \frac{60\ \text{minutes}}{1\ \text{hour}} \times \frac{60\ \text{seconds}}{1\ \text{minute}} = 12600\ \text{seconds}$$

Chapter 1.4: Presenting Scientific Data,

- Graph – visual display of information or data
- Scientists graph the results of their experiment to detect patterns easier than in a data table.
- Line graphs – show how a relationship between variables change over time
  - Ex: how stocks perform over time
- Bar graphs – comparing information collected by counting
  - Ex: Graduation rate by school
- Circle graph (pie chart) – how a fixed quantity is broken down into parts
  - Ex: Where were you born?

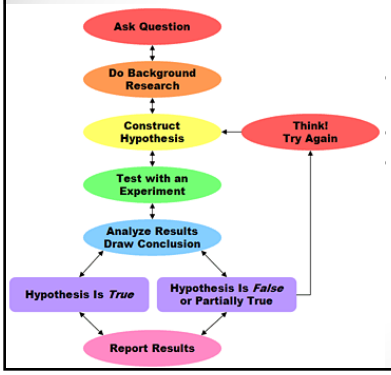
Parts of a Graph



Parts of a Graph

- Title: Dependent Variable Name vs. Independent Variable Name
- X and Y Axes
  - X-axis: Independent Variable
  - Y-axis: Dependent Variable
  - Include label and units
  - Appropriate data range and scale.
- Data pairs (x, y): plot data, do NOT connect points.
- Best Fit Line to see general trend of data.

Ch 1.2: Using a Scientific Approach, pg 7-11



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