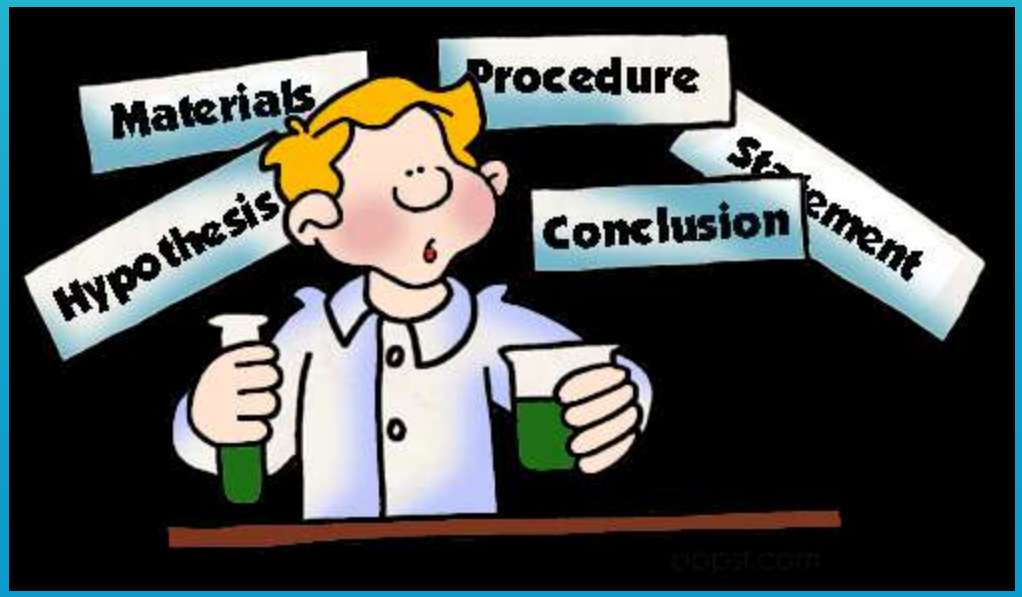
Section 1.2: Scientific Methods pg.8-11

Objectives

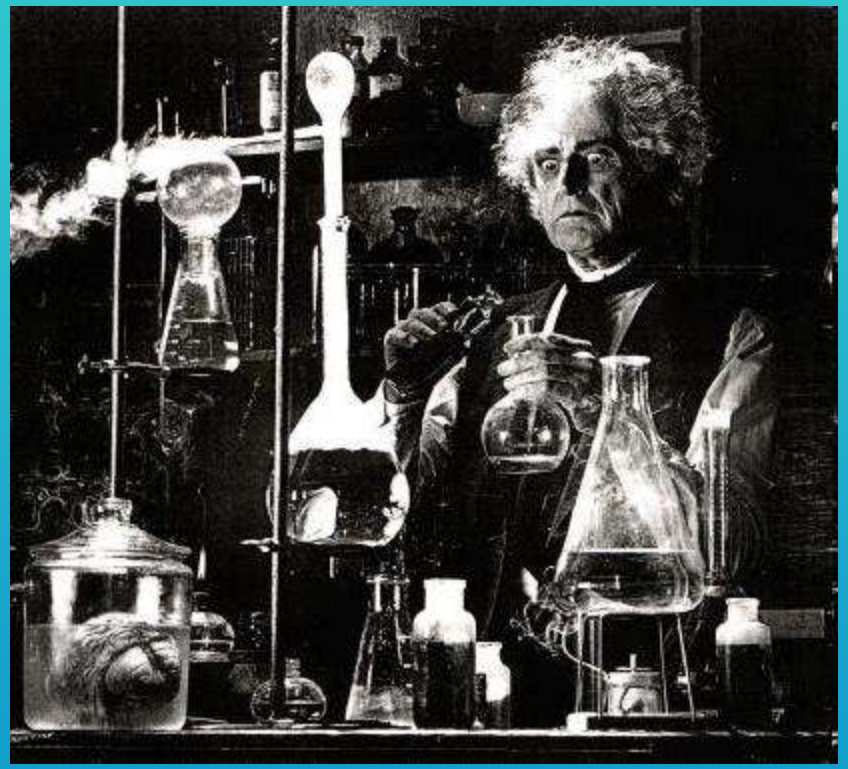
*Describe scientific methods.



Section 2 Scientific Methods pg.12-14

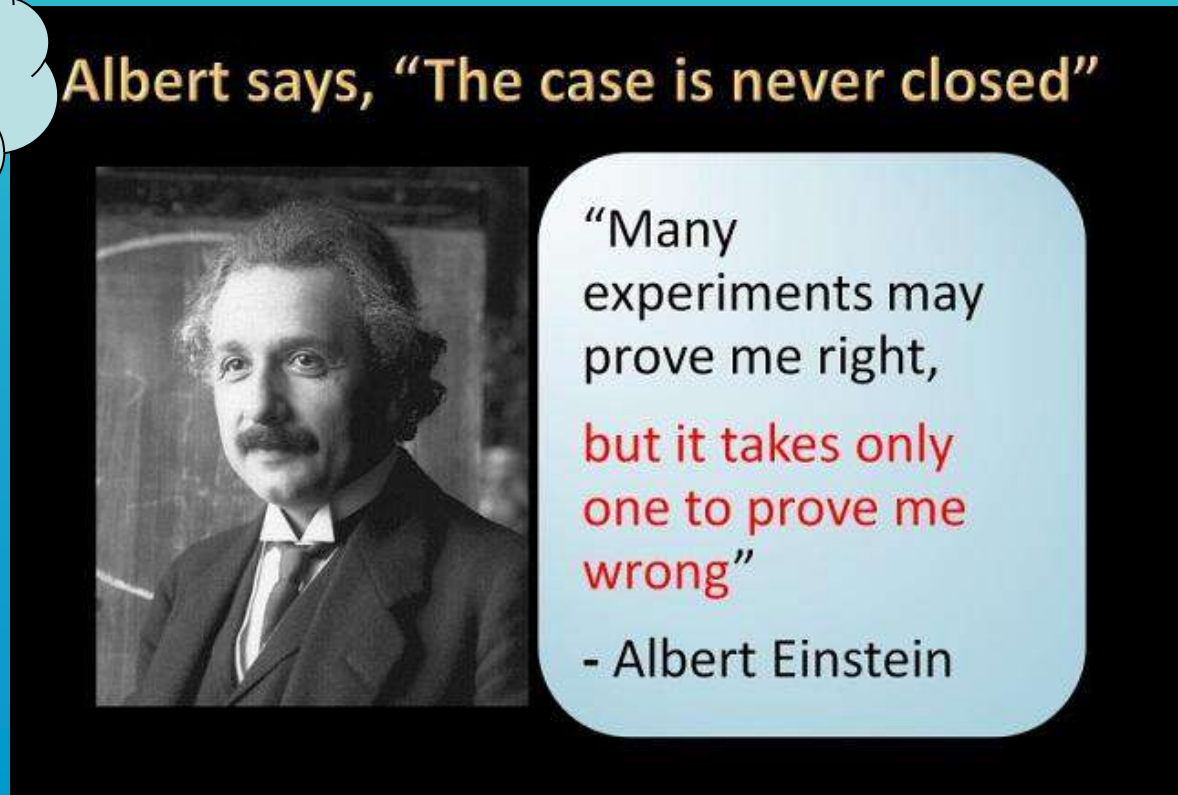
Objectives

- **Determine** the appropriate design of a controlled experiment.
- **Use** information in tables and graphs to analyze experimental results.
- **Explain** how scientific knowledge can change.

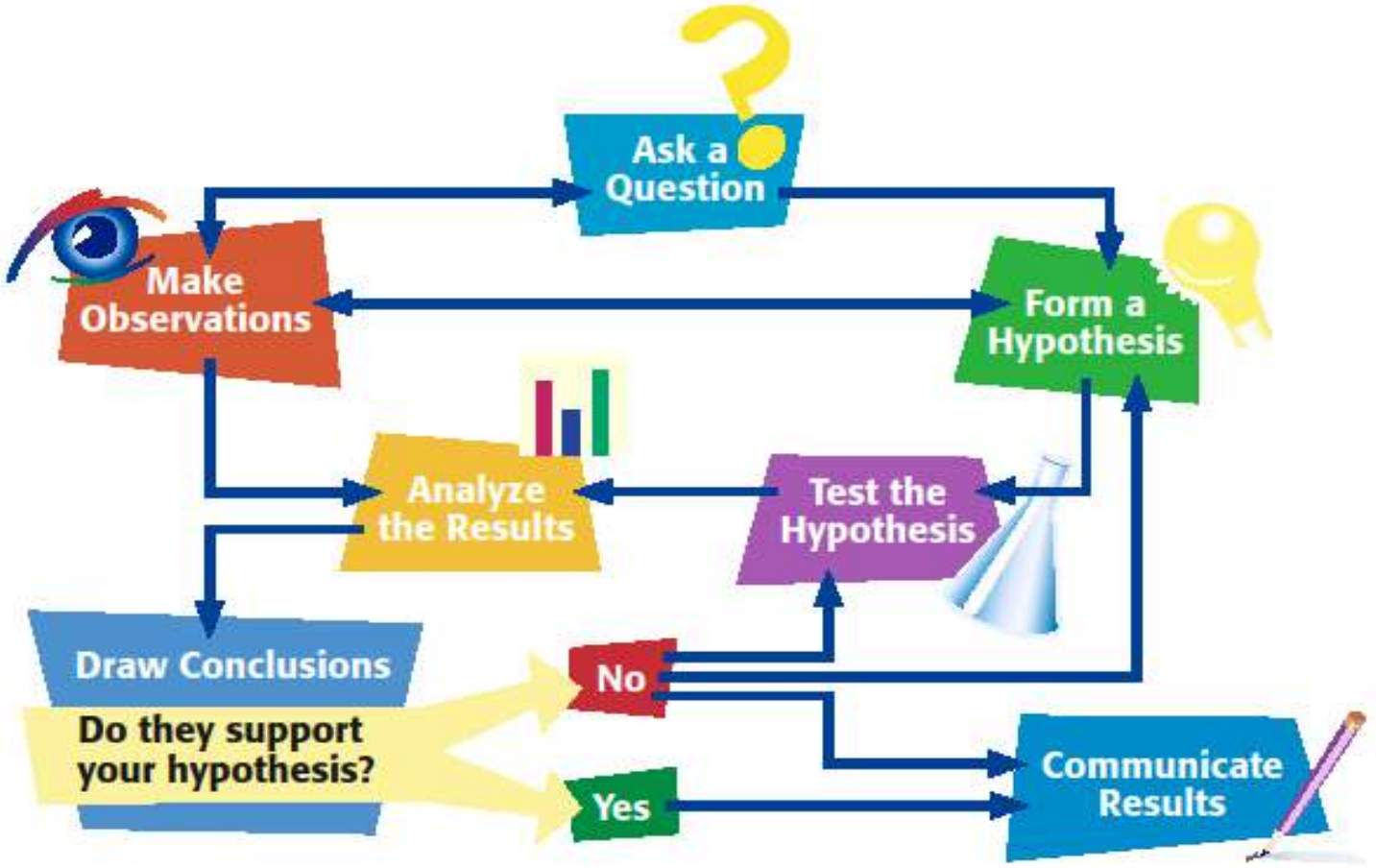


I. What Are Scientific Methods?

A. Scientific methods are the ways in which scientists answer questions and solve problems.

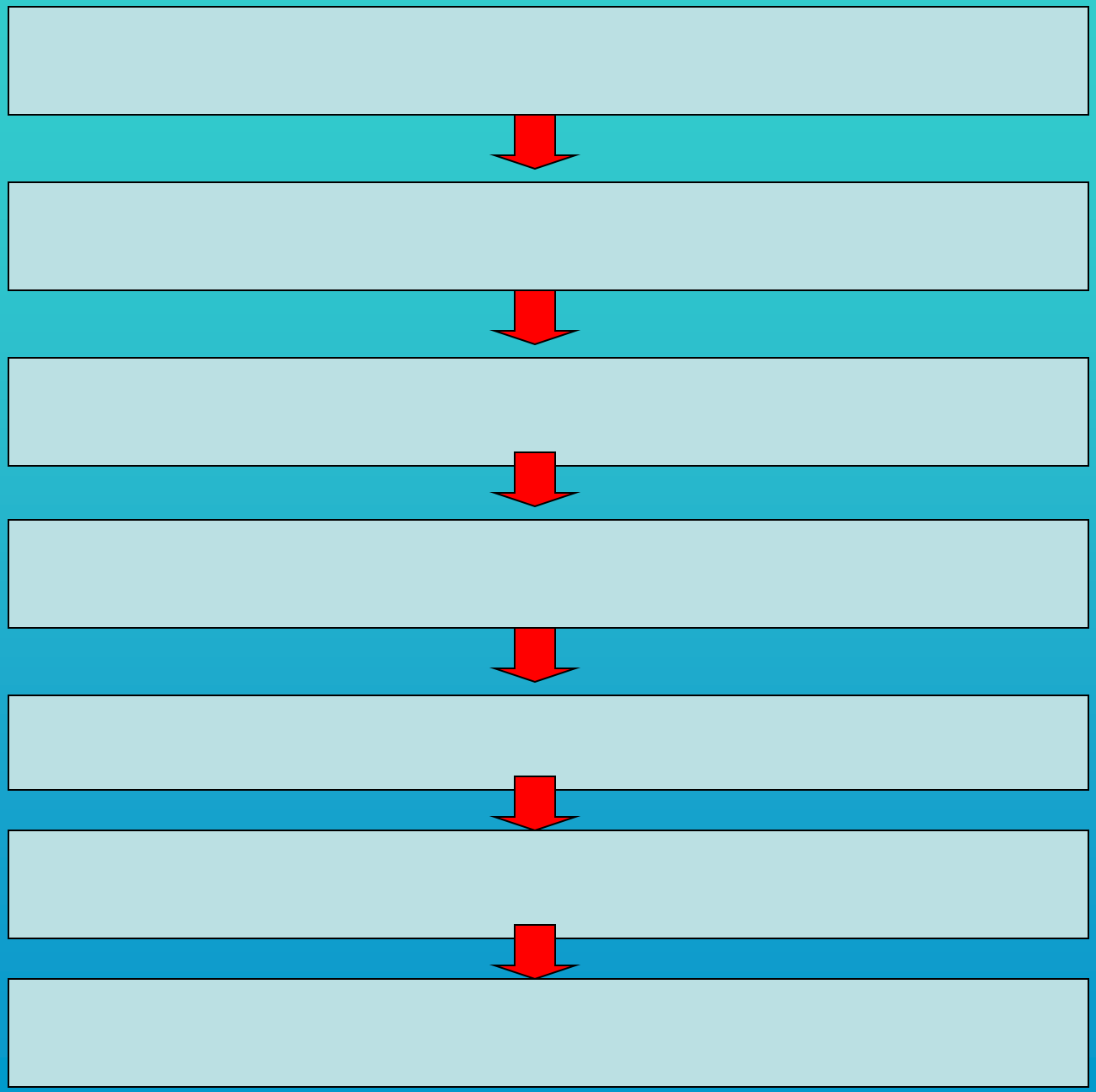


Scientific Methods



Annie May Found Twenty Adorable Dogs and Cats.

The Scientific Method



II. Ask a Question

A. Asking a question helps focus the purpose of the investigation. Scientists often ask a question after making an observation.

B. For example, students observing deformed frogs might ask, “Could something in the water be causing the deformities?”

What questions can you ask about this picture?

A baby hippopotamus that survived the tsunami waves on the Kenyan coast has formed a strong bond with a giant male century-old tortoise. After the hippopotamus, nicknamed Owen, was swept away and lost its mother, the hippo was traumatized. It had to look for something to be a surrogate mother.

Fortunately , it landed on the tortoise and established a strong bond. They swim, eat, and sleep together. The hippo follows the tortoise exactly the way it followed its mother. If somebody approaches the tortoise, the hippo becomes aggressive, as if protecting its biological mother.

The hippo is a young baby, he was left at a very tender age and by nature, hippos are social animals that like to stay with their mother for four years.

C. Make Observations

D. Accurate Observations

Any information that you gather through your senses is an observation. Scientists use standard tools and methods to make and record observations.

What observations can you make about this fennec fox? (Qualitative and Quantitative)

III. Form a Hypothesis

A. A **hypothesis** is a possible explanation or answer to a question that is based on observation and can be tested. AKA: Educated Guess

B. A statement of cause and effect that can be used to set up a test for a hypothesis is called a **prediction**.

Critical Thinking Time: Writing Predictions

- Write predictions for these questions using an if-then statement.

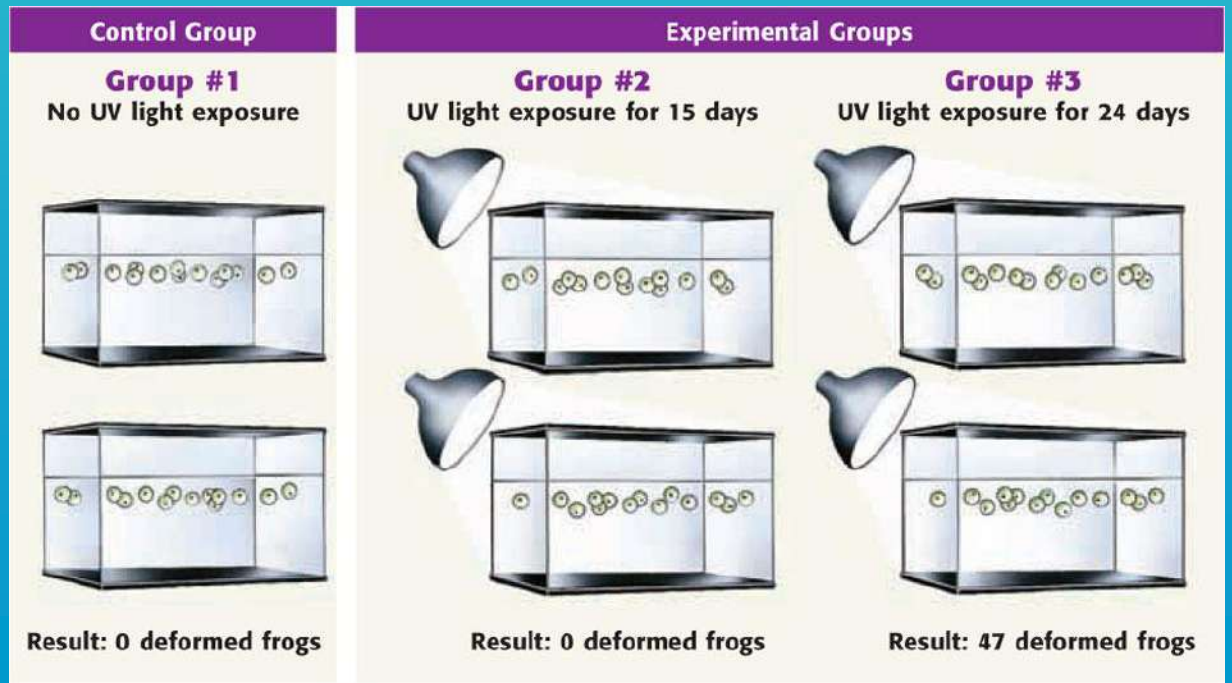
Example

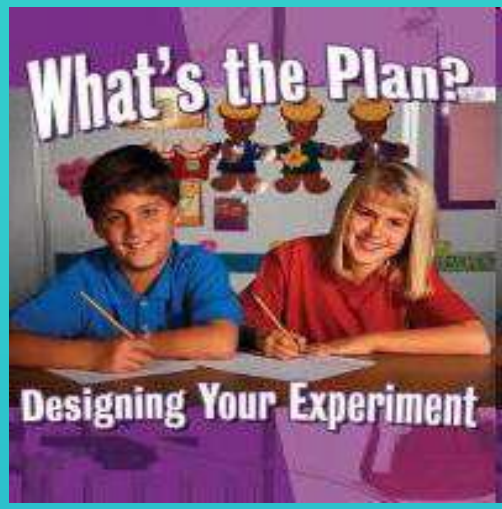
- Will an ice cube float in water?
- *If an ice cube is placed in water, then it will float.*

1. Is an unknown liquid water or rubbing alcohol?
2. Can plants sense which way is up?
3. Do cardinals prefer sunflower seeds to smaller seeds?

I. Test the Hypothesis

A. Under Control A controlled experiment tests only one factor at a time and consists of a control group and one or more experimental groups.





B. Designing an Experiment Designing a good experiment requires planning and a consideration of all factors.

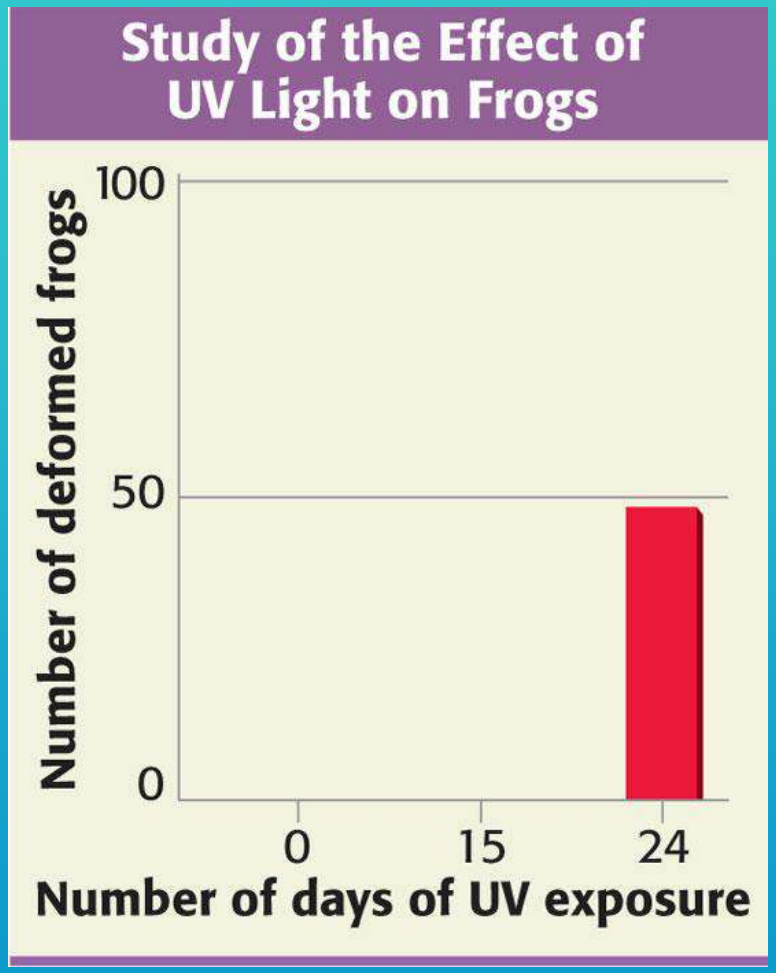
C. Independent Variable-The factor that can be changed.

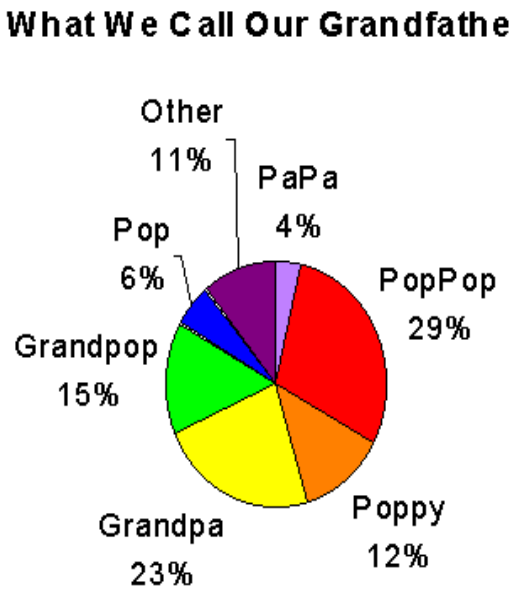
D. Dependent Variable-What you measure in an experiment and what is affected during the experiment.

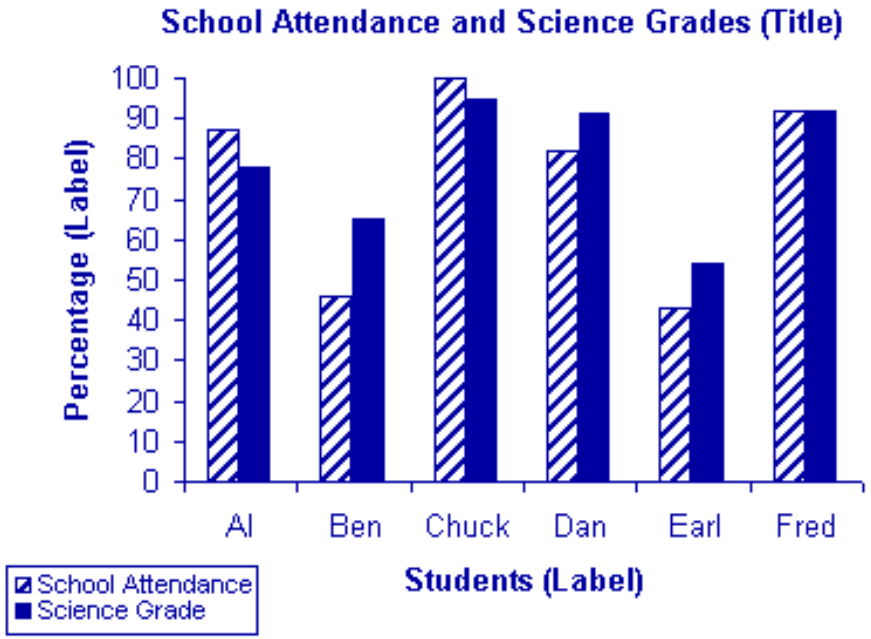
E. Collecting Data Scientists keep clear, accurate, honest records of their data so that other scientists can repeat the experiment and verify the results.

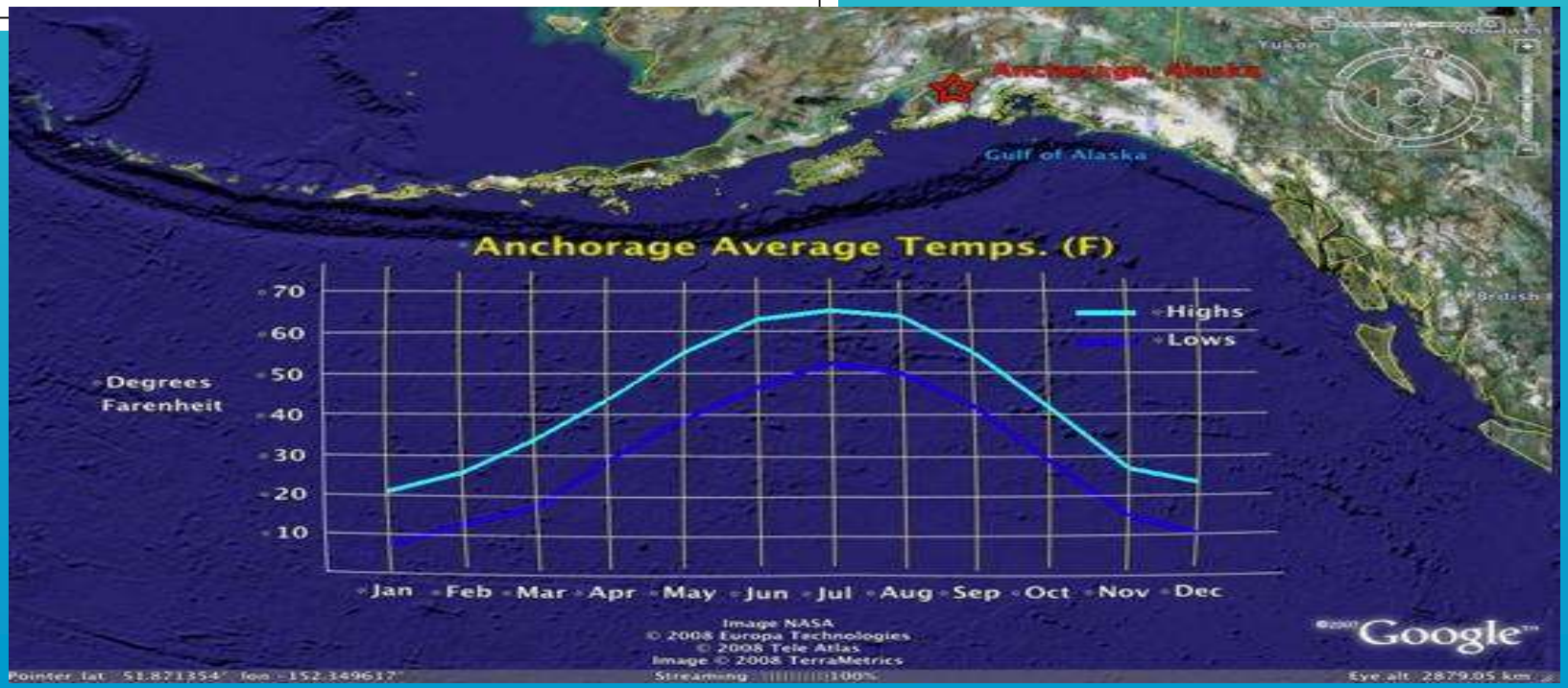
II. Analyze the Results

A. After they finish their tests, scientists must analyze the results. Analyzing the results helps scientists explain and focus on the effect of the variable.




What We Call Our Grandfathers
Other
11%
PaPa
4%
Pop
6%
PopPop
29%
Grandpop
15%
Grandpa
23%
Poppy
12%


School Attendance and Science Grades (Title)
Percentage (Label)
100
90
80
70
60
50
40
30
20
10
0
Al
Ben
Chuck
Dan
Earl
Fred
Students (Label)
School Attendance
Science Grade


Anchorage, Alaska
Gulf of Alaska
Anchorage Average Temps. (F)
Degrees Farenheit
70
60
50
40
30
20
10
Highs
Lows
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
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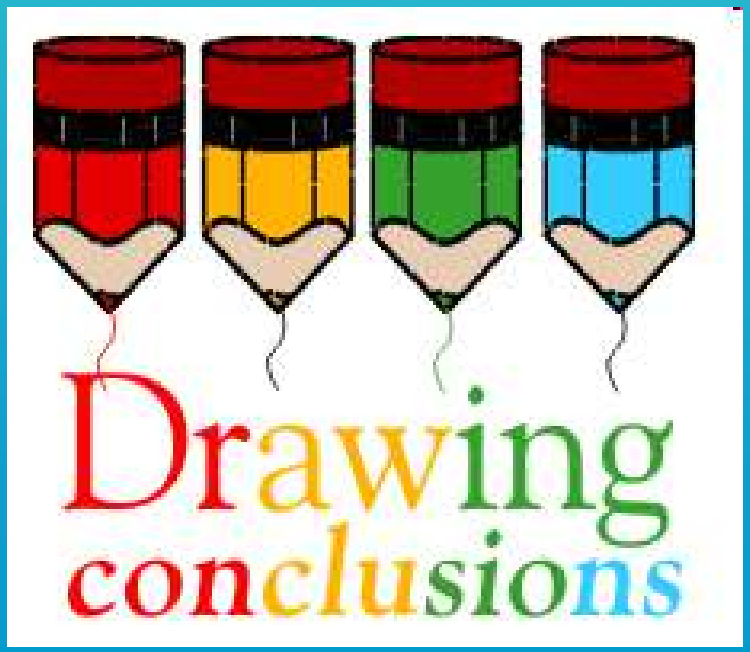
III. Draw Conclusions

A. Scientists must conclude if the results of their tests support the hypothesis. Proving that a hypothesis is not true can be as valuable as proving that it is true.



IV. Communicate Results

A. After finishing an investigation, scientists communicate their results.

B. Sharing allows other scientists to repeat experiments to see if they get the same results.

C. Sometimes, new data lead scientists to change their hypotheses.

A new product on the market call "Stache" claims to grow a long and thick mustache in just 5 days. A scientist wants to test this claim. He takes two identical twins and gives one the product to use. Twin "A" uses the product while Twin "B" does not. After 5 days he records his results.

1. What type of experiment is this?
2. How do you know what type of experiment this is?
3. What is the independent variable?
4. What is the dependent variable?
5. What is a control variable?

A scientist wants to see if the name brand dandruff shampoo prevents dandruff better than the off brand shampoo. The scientist will see which person produces less dandruff. The scientist sets up an experiment with two identical twins. One twin uses the name brand shampoo for a week and the other uses the off brand shampoo.

1. What type of experiment is this?
2. How do you know?
3. Name a controlled variable.
4. Name the independent variable.
5. Name the dependent variable.

A student wants to know if the sex of a person affects the amount of time it takes to find a face in a picture of beans. The students tries to control as many outside distractions as possible so all subjects look at the picture on the same computer and view it from the same room. For her experiment, she tests 25 males and 25 females (all the same age).

A scientist wants to see if degree clinical strength deodorant works better than regular Degree deodorant. By "works better" the scientist means does it cause you to sweat less. The scientist sets up an experiment with two identical twins. One twin uses the Clinical strength for a week and the other uses the regular degree deodorant.

1. What type of experiment is this?
2. How do you know?
3. Name a controlled variable.
4. Name the independent variable.
5. Name the dependent variable.

A scientist wants to test if light affects plant growth. He places one plant in the light and the other in the dark. The plants, soil, pots, and amount of water are the same. The only thing he changed in the experiment is the light and dark areas for the plants.

1. What type of experiment is this?
2. How do you know?
3. What is the independent variable?
4. What is the dependent variable?
5. Name two control variables.

A scientist wants to determine if a special juice will help mice develop big muscles. He has two mice. He use the same cages and same breed of mice. He keeps them in the same area and gives them the same amount of food and water. The only difference is that Mouse A receives daily doses of the special juice and Mouse B does not.

1. What type of experiment is this?
2. How do you know what type of experiment this?
3. What are the control variables?
4. What is the independent variable?
5. What is the dependent variable?