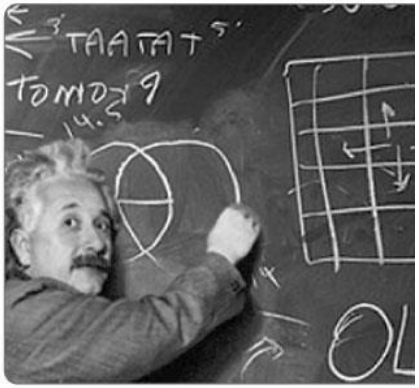
is…..

an organized way of using evidence to learn about the natural world.

It also refers to the body of knowledge scientist have built up over the years.



What is the goal of science?

The goal is science is to…..

1. **investigate and understand the natural world.**
2. **explain events in the natural world.**
3. **use those explanations to make useful predictions**

Thinking Like a Scientist

- Scientific thinking begins with **observation**!
- **Observation** is the process of gathering information about events or processes in a careful, orderly way.

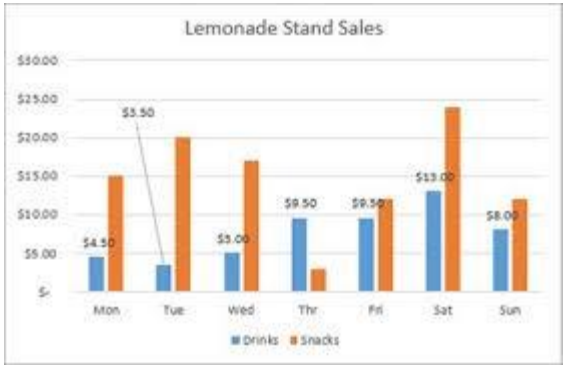
Thinking Like a Scientist

The information gathered from observations is called **data**.

2 main categories of data!

Quantitative - numbers

Qualitative - characteristics



Thinking Like a Scientist

Scientists use data to make **inferences**.

An **inference** is a logical interpretation based on prior knowledge or experience.

Explaining and Interpreting Evidence

A **hypothesis** is a <u>proposed scientific explanation</u> for a set of observations.

<u>A hypothesis may be ruled out or confirmed.</u>

The Scientific Method

1. Make an observation.
2. Ask a question.
3. Form a hypothesis. (an if-then statement)
4. Set up a controlled experiment/procedure!!!!!
5. Record and analyze results
6. Draw a conclusion
7. Repeat investigation

Scientific Method

The process scientists use to investigate phenomena and gather data

- Observation My flashlight does not work.
- Question Why doesn't my flashlight work?
- Hypothesis The flashlight's batteries are dead.
- Prediction If I replace the batteries then the flashlight will work.
- Experiment Replace the batteries with new ones.
- Record & Analyze Results: Conclude
  - The flashlight works: The batteries in the flashlight were dead. Now…repeat the experiment to validate the results.
  - The flashlight does not work: The batteries are not the problem. … New hypothesis? If I replace the light bulb, then the flashlight will work.

A Controlled Experiment is Born!!!

A case study about designing an experiment….

For hundreds of years people accepted the idea (hypothesis) that life arose from non-living matter, this idea was called **spontaneous generation**.

An experiment is born…….

In 1668 Francesco Redi set out to test his hypothesis, which went against a common assumption about life; that life can spontaneously form.

"I think the flies produce the maggots, I do not think they just appear out of nowhere!!!!"

Redi's Next Step…….

To test his hypothesis about the appearance of maggots, Redi designed an **EXPERIMENT**!!!

Redi's Experiment on Spontaneous Generation

OBSERVATIONS: Flies land on meat that is left uncovered. Later, maggots appear on the meat.

HYPOTHESIS: Flies produce maggots.

PROCEDURE

Controlled Variables: jars, type of meat, location, temperature, time

Redi's Experiment on Spontaneous Generation

Manipulated Variable: gauze covering that keeps flies away from meat

Responding Variable: whether maggots appear

CONCLUSION: Maggots form only when flies come in contact with meat. Spontaneous generation of maggots did not occur.

Let us Talk About Variables…..

What is a variable????

A **variable** is a factor in an experiment that can change!

Examples of Variables: materials used, amount of materials used, temperature, light and time.

Variables

Manipulated Variable (independent variable)

- variable that is changed.

Responding Variable (dependent variable)

- variable that is observed and that changes in response to the manipulated variable.

Controlled Experiment

- When only 1 variable is changed at a time.

Repeating Investigations

Scientific experiments based on a hypothesis should be able to be repeated in order for the hypothesis to remain valid or to disprove the hypothesis.