

**Science:** body of knowledge gained through experimentation

**Scientific Method:** a logical way to solve a problem

only science problems?

**1-Question, Problem:** begins w/observation & curiosity

needs to be well-defined, specific

from the stated problem, someone should be able to tell

what you are measuring

**2-Research,** background info: educate yourself about prob

what if you find prob has been answered?

you may narrow problem even more after research

## Scientific Method cont.

**3-Hypothesis:** educated guess, prediction of what you think will happen  
must be testable  
should be stated in if/then form (this identifies IV/DV)

## 4-Design & conduct Experiment

-2 Main Groups: control & experimental  
**control:** basis for comparison, the natural state, the group receiving no treatment

**experimental group:** the group(s) receiving a different treatment, the group that receives the factor being tested

**-Variables: independent (IV) & dependent (DV)**

IV: the change that you design into the experiment, the factor being tested

DV: the factor that is being measured, the change that occurs b/c of IV

**-Standard Conditions, Constants**

everything that is kept the same btw control & experimental groups  
only IV should be different

Sci. Meth. cont.

**5-Results:** carry out experiment & obtain data,  
quantitative data  
the major activity here is to organize data in  
meaningful way (tables & graphs)

**6-Analysis:** pick apart data & determine what it means  
compare experimental group to control group  
is there a difference? is the difference  
significant? how do we tell this?

**7-Conclusion:** summary of experiment  
did the experiment support or refute the hypothesis?  
can we say we proved our hypothesis in one exp?  
good experiments lead to new questions

## Types of Scientific Studies

### 1-Manipulative Experiments

typical experiment where you change the variables  
you design difference btw control & exp grps  
ex: heart rate vs. exercise

### 2-Observation Experiment or Naturalistic Study

you still ask questions & design exp but observation is  
main way to gather data

ex: studying wolves in wild, studying animals in zoo  
still identify IV & DV, but you are not changing  
conditions, you are correlating 2 things

this experiment can then lead to manipulative exp

### 3-Collection study

collect & identify objects, putting into categories of  
relationships

ex: shells, leaves, fossils

you can use collections to answer questions, can also  
use data obtained to design manipulative exp.

### 4-Model study

build model to explore how something works  
then can try to modify existing model with  
manipulative exp

ex: volcano, bridges

### 5-Invention Study

involves making a piece of equipment using scientific  
knowledge

utilize steps of scientific method to see how well  
invention works & to refine it

the process of science

**Hypotheses:** for each experiment, you make a hypothesis  
which is a prediction of how something works  
hypotheses must be testable

after an experiment, your hypothesis is either supported or  
refuted by data

if it is supported, more experiments are done to test it

if it is continually supported, it may become a fact

**scientific fact:** a behavior or phenomenon that has been  
repeatedly observed and is considered to be a truth  
by a consensus among scientists

**Scientific Law:** describes a generalization or pattern  
observed in the natural world that is based on  
many many observations (experiments) over time  
laws are supported by facts

laws are often expressed as a relationship or in  
mathematical terms

BUT laws give no explanation for why things occur

**Theories** are more complex than laws  
theories offer an explanation for why a phenomenon  
occurs or why a relationship exists

theories are well-supported by data and facts over a  
long period of time

sometimes theories explain multiple laws

in science, a Theory is considered to be a truth  
in general public, we use theory loosely, like a  
hypothesis

laws and theories can be modified as we gain more info  
through better technology, but rarely totally disproven

Pseudoscience: false science

ex: