

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 will be measuring

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

what if you find the prob has been answered?

you may narrow prob even more after research

3-Hypothesis: educated guess, prediction of what you think will happen

must be testable

given in if/then form (this identifies IV, DV)

4-Design & conduct experiment

2 main groups: control & experimental

control group: the basis for comparison, the natural state, the group receiving no treatment

experimental grp: the group(s) receiving a different treatment contains the factor you are testing

Scientific Method cont.

4-Design Exp cont.

variables: Independent (IV) and Dependent (DV)

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

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

Standard Conditions, Constants

everything that is kept the same btw the control & exp grps  
only IV should change

5-Results: carry out exp & obtain data, quantitative data  
organize data in meaningful way

6-Analysis: pick apart the data and determine what it means  
compare exp grp w/control grp  
is there a diff? is the diff significant? is it real?

7-Conclusion: summary of exp  
did exp support or refute hypoth?  
can we say we proved our hypoth?  
what exp can lead from this one?

## Types of Scientific Studies

### 1-Manipulative Exp

typical exp where you manipulate the variables

you design a diff btw control & exp grps

ex: heart rate exp

### 2-Observation Exp or Naturalistic Study

you still ask question & 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 the conditions,  
you are correlating 2 things

you can do manipulative exp in zoo or in wild, you can change conditions

### 3-Collection Study

collect & identify objects, putting into categories of relationships

ex: shells, bugs, leaves

can use to answer questions, can also used data obtained to design a manipulative exp.

#### 4-Model Study

build model or try to modify existing model

ex: volcano

#### 5-Invention Study

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 hypothesis which is a prediction of how something works

hypotheses must be testable

after exp, your hypothesis is either supported or refuted by data

if it is supported, more exp are done

if 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 explanations 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 modifies as we gain more info through better technology

Pseudoscience: false science

ex: