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 <u>proved</u> 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