

## SCIENTIFIC LAB DESIGN

### QUESTION:

- Relevant, testable, scientific

### KNOWN/RESEARCH:

- Brainstorm your Personal Knowledge and research Scientific Articles

HYPOTHESIS: Your educated guess as to what the answer to the question is

### PROCEDURE:

- Sometimes teacher-provided, sometimes student-designed
  - Always step-by-step
  - Repeatable
  - Tests only one variable
    - Dependent Variable = the thing we are planning to measure; what you are testing
    - Independent Variable = the thing in the experiment we change
    - the increments you will take the data in
      - ex. time, temperature, pH,...
  - Control Group = group that is NOT changed/tested
    - Used to compare results to
  - Experimental Group = group that is tested
  - Sample Size = the number of subjects to be tested
- Constants - factor that stays the same

OBSERVATIONS/DATA: throughout the experiment

- Observations must be done with the 5 senses
- Can be:
  - Qualitative: general observations
  - Quantitative: measure amounts, sizes, etc.
    - Use a numerical value
- Avoid inferences = an assumption based on experience but not necessarily fact

add constants

## DATA ANALYSIS:

- Putting the data into numerical form or doing any necessary calculations
- Ex. Calculate averages (means), deviations, etc.
- Allows you to determine if your data is **valid** = shows real connections between the variable and the outcome

## EXPLANATION: (conclusion)

- Claim: A that answers the original question
- EVIDENCE: What from your data supports your claim
- REASONING: Justification of why the evidence counts as evidence OR connects your findings to the evidence.

## Retesting: (multiple trials)

- We always re-test an experiment multiple times and by multiple groups for reliability

SCIENTIFIC LAW = a statement based on repeated experimental observations that describes some aspects of the universe.

- A **scientific law** always applies under the same conditions
- Describes what ALWAYS will happen in a given situation
- Ex. Law of Gravity

SCIENTIFIC THEORY = a well-supported explanation that is acquired through the **scientific** method and repeatedly tested and confirmed through observation and experimentation

- Cannot be proven right
- Continues to be questioned
- Can eventually be agreed upon to become a law if enough evidence is found
  - Ex. Big Bang Theory