Physical Science
Scientific Method

Objective 1 Experimental Design

- **Can design a valid experiment, (correctly identifying Ind/Dep variable and what variables must be held constant) and describe the experimental procedure clearly.**

- Recognizes or recalls specific terminology, such as:
  independent and dependent variables, controls, constants
- Performs basic processes, such as:
  identifying the above terms when given a procedure.

Scientific Method

- Steps or techniques that are used to organize and acquire knowledge

Steps:

1. Observe
2. Question
3. Hypothesis
4. Experimentation
5. Conclusion

Hypothesis

- An educated guess
  - *Can be correct or incorrect (remember it's a prediction that can be tested)*

Example:

If_____, then _____.

Let's use some paper clips and a beaker of water.

Bad Hypothesis:
The water will rise.
(You haven't given a reason why you think that will happen!)

Good Hypothesis:
If I put paper clips in the beaker of water, then the water will rise.

Experimentation

- -to test my hypothesis
- Two Groups:
  - Experimental Group- receives some kind of treatment
  - Control Group- receives no treatment; used to compare

Everything about the two groups except the variable you are testing must remain the same.

Types of Variables

- Independent Variable
  - – something that is changed by the scientist
  - What is tested?
  - What is manipulated?

Types of Variables

- Dependent Variable
  - – something that might be affected by the change in the independent variable
  - What is observed or measured?

Types of Variables

- Controlled Variable
  - – a variable that is not changed
  - Also called constants or controls
  - Allow for a “fair test”

For Example

- Students of different ages were given the same jigsaw puzzle to put together. They were timed to see how long it took to finish the puzzle.

What was the independent variable?

- Ages of the students
  - Different ages were tested by the scientist

What was the dependent variable?

- The time it took to put the puzzle together
  - The time was observed and measured by the scientist
  - Hi! Are you all enjoying my class yet? ☺

What were the controlled variables?

- Same puzzle
  - All of the participants were tested with the same puzzle.

Another example

- An investigation was done with an electromagnetic system made from a battery and wire wrapped around a nail. Different sizes of nails were used. The number of paper clips the electromagnet could pick up was measured.

Independent variable:

- Sizes of nails
  - These were changed by the scientist

Dependent variable:

- Number of paper clips picked up
  - The number of paper clips observed and counted (measured)

Controlled variables:

- Battery, wire, type of nail
  - None of these items were changed

Theory vs Law

- Theory
  - Uses observations and loads of experimental proof
  - Logical explanation
  - Flexible

Law

- Uniform and universal
- Stands the test of time