



Controlled Experiment

The goal of a controlled experiment is to TEST the effect of a **VARIABLE!**

Variables

- Factors that MAY change during an experiment
- 2 types:
 - Independent Variable
 - Dependent Variable



2 Types of Variables

- Independent Variable (IV)
 - The variable that is changed by the experimenter
- Dependent Variable (DV)
 - The variable that CHANGES due to the manipulation of the IV

Let's watch the [VARIABLES SONG!](#)

In a Controlled Experiment, We Want to Know:

- What effect does the IV have on the DV?

- Examples:

- 1.What effect does water temperature have on plant growth?



- 2.What effect does light have on the activity of pill bugs?

- 3.What effect  does studying have on test grades?

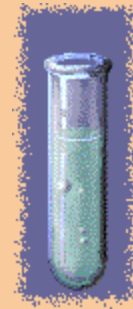


Sharing Time!!!

WHAT EFFECT DOES X HAVE ON Y?

MAKE UP YOUR OWN EXAMPLE

Could We Design An Experiment to Test These?



Control Group

- Standard group
- All other groups are compared to this group
- Example:
 - When testing for growth depending on amount of water added, the plant that is given the same amount of water is what the other groups are being compared to

Experimental Group

- Group(s) that test the IV
- Example:
 - Each group has a plant. The plant in the first group is given 4 tablespoons of water a day. The second group is given 6 tablespoons a day, the third is given 10 a day and so on...

This is Essential for Scientific Method!

- Step 1: Statement of the problem
 - Based on observations or research create a QUESTION you want to scientifically test
 - Create an experiment and follow the scientific method



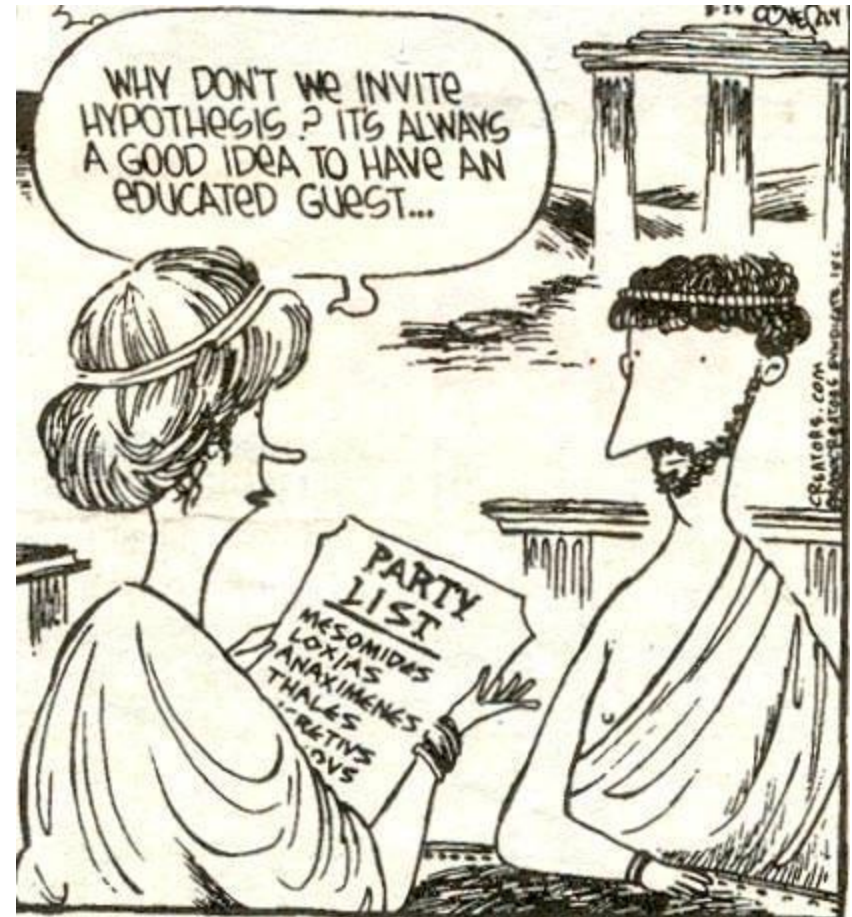
Scientific Method

- Step 2: Hypothesis
 - Create a PREDICTION of the OUTCOME of the experiment



2.) Hypothesis

- To solve this problem or question, scientists form a hypothesis
- Hypothesis is:
 - A statement on what they expect to find out
 - A possible explanation for observations that relate to a scientific problem
 - Must be testable by observation OR experiment



Scientific Method

- Step 3: Experimental Design****
 - Design a controlled experiment that includes a CONTROL GROUP and EXPERIMENTAL GROUP(S) that will test the IV
 - Perform experiment

Scientific Method

- Step 4: Collect Data
 - Create a data chart and ORGANIZE the observations (DATA) collected during the experiment

Data for heating crystals

	Trial 1		Trial 2		Trial 3	
Avg = 4 Alum S = 0	4	4	4	4	4	4
Avg = 0.133 Salt S = 0.352	0	0	0	0	0	0
Avg = 2.63 Sugar S = 1.246	3.5	3	3.5	3	3.5	3

4.) Results

- Data collection!
- 2 types of data:
 - Quantitative
 - Qualitative



4.) Continued

- Quantitative:
 - Numerical measurement: Amount, temperature, length, mass
 - Measured with the metric system
 - Discrete, categorized
- Example: Fenway Park has 39,605 seats

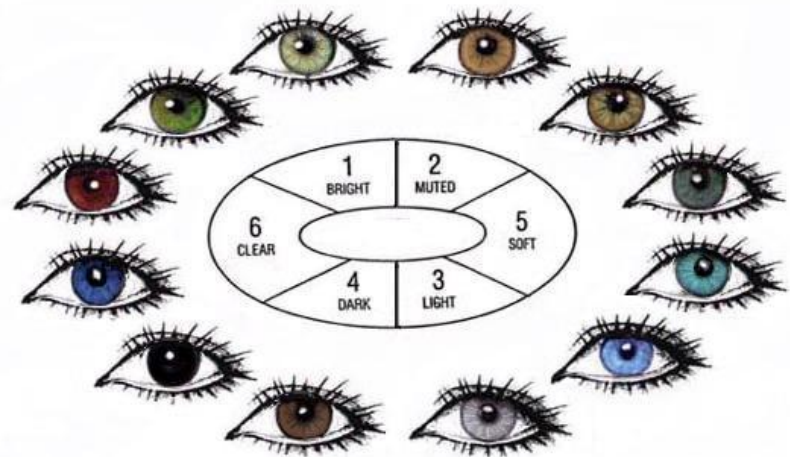


4.) Continued

□ Qualitative:

- Physical description like color, smell, or sound that do not involve numbers or measurement
- Has a continuous quality, cannot put into categories like quantitative

□ Example: Mrs. Silvia has brown eyes



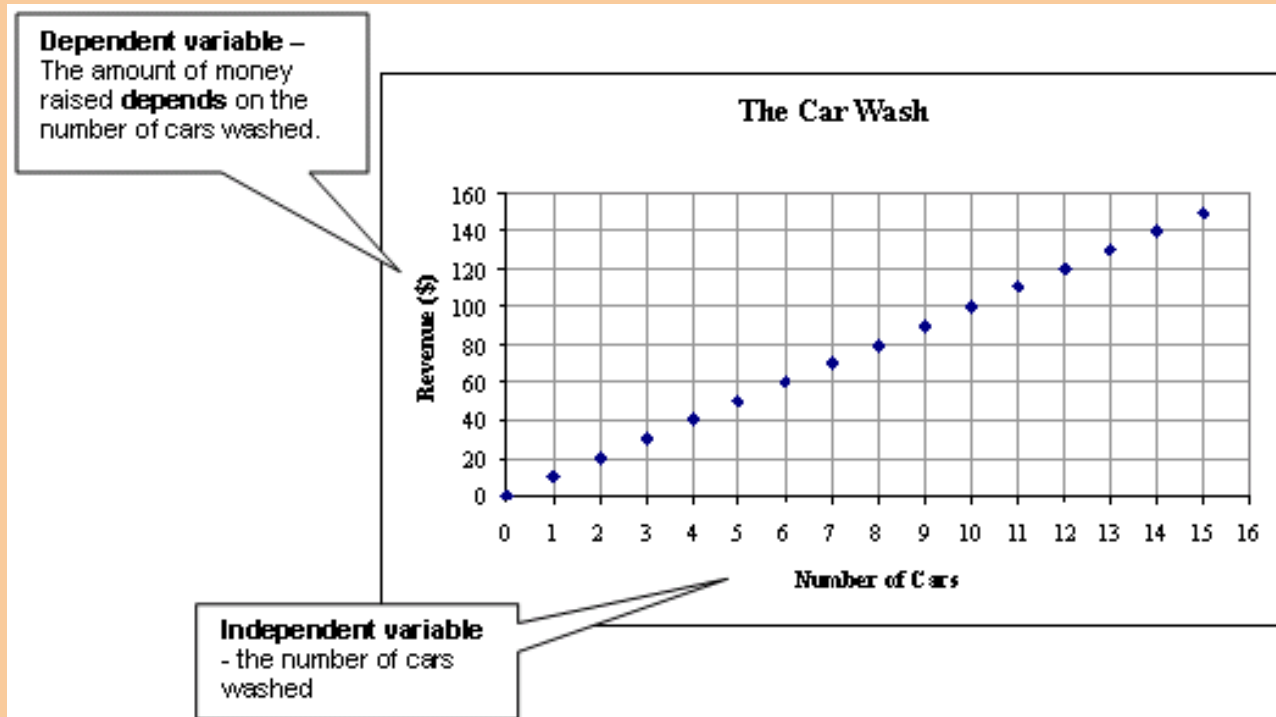
Scientific Method

- Step 5: Analyze Data

- Create a GRAPH and plot data to look for TRENDS AND PATTERNS between the IV and DV from the experiment

- IV = X-axis

- DV = Y-axis



Scientific Method

•Step 6: Conclusion

- What was the objective/question?
- Was the hypothesis supported or refuted?
- Based on the DATA collected what was the outcome of the experiment? (USE EXAMPLES)
- Did the result answer the original question?
- States what went right or wrong in the experiment
 - Was it accurate or valid?
 - How do these errors affect the experiment?

Let's get started

Let's make an
experimental design!



Key Concepts:

- In a controlled experiment, only change 1 variable at a time
 - Allows experimenter to compare to control group to see how that one variable took effect
 - Results will be valid from comparison
 - Valid results allow accurate conclusions!