Image from: http://en.wikipedia.org/wiki/The_Simpsons

Simpson's Scientific Method

Slide show modified from worksheet by Kim Foglia:
http://www.biologycorner.com/worksheets/controls.html

EXPERIMENTAL DESIGN

- A CONTROLLED experiment must see the effect of ONE VARIABLE at a time
- Hard to do in field/lab
- Don't eliminate unwanted variables….
  cancel their effects by using a CONTROL GROUP
- Must be repeated (at least 3 X)
- Can't ignore or rule out data which do not support the hypothesis

VARIABLES

A variable is any factor, trait, or condition that can exist in differing amounts or types.

- **independent variable** is the one that is changed by the scientist.
- **dependent variable** is observed to see how it responds to the change made to the independent variable. The new value of the dependent variable is caused by and depends on the value of the independent variable.
- **controlled variables**. are quantities that a scientist wants to remain constant, and must be observed as carefully as the dependent variables.

HYPOTHESIS	Independent variable (What I change)	Dependent variable (What I observe)	Controlled variables (What I keep the same)
If fertilizer is added, then a plant will grow bigger.	Measure amount of fertilizer (grams)	•Growth of the plant measured by its height •Growth of the plant measured by the number of leaves •There are other ways to measure growth	•Same size pot •Same type of plant •Same type and amount of soil •Same amount of water and light •Make measurements of growth for each plant at the same time The many variables above can each change how fast a plant grows, so to insure a fair test of the fertilizer, each of them must be kept the same for every pot.

Smithers thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers each and assigns each group the same task (in this case, they're supposed to staple a set of papers). Group A is given the special juice to drink while they work. Group B is not given the special juice. After an hour, Smithers counts how many stacks of papers each group has made. Group A made 1,587 stacks, Group B made 2,113 stacks.

Identify the:

1. Control Group (What I keep the same)

(What could affect work output besides juice?)

Group that does not get special juice

2. Independent Variable (What I change)

Drinking special juice

- 3. Dependent Variable (What I observe)

Amount of stapling

- 4. What should Smithers' conclusion be?

Its possible that juice helps BUT….
need more experimental data

5. How could this experiment be improved?

Homer notices that his shower is covered in a strange green slime. His friend Barney tells him that coconut juice will get rid of the green slime. Homer decides to check this this out by spraying half of the shower with coconut juice. He sprays the other half of the shower with water. After 3 days of "treatment" there is no change in the appearance of the green slime on either side of the shower.

6. What was the initial observation?

Green slime in shower

Identify the-

7. Control Group

Shower side receiving water

8. Independent Variable (what I change)

Coconut juice

9. Dependent Variable (what I observe)

Amount of green slime

10. What should Homer's conclusion be?

Coconut juice does not remove green slime from showers in 3 days

Bart believes that mice exposed to microwaves will become extra strong (maybe he's been reading too much Radioactive Man). He decides to perform this experiment by placing 10 mice in a microwave for 10 seconds. He compared these 10 mice to another 10 mice that had not been exposed. His test consisted of a heavy block of wood that blocked the mouse food. he found that 8 out of 10 of the microwaved mice were able to push the block away. 7 out of 10 of the non-microwaved mice were able to do the same.

Identify the-

11. Control Group

(What are some things that could affect ability of mice to push block besides microwaving them?)

12. Independent Variable (What you change)

Microwaving

13. Dependent Variable (What you measure)

Pushing block of wood

14. What should Bart's conclusion be?

NEEDS MORE EXPERIMENTAL DATA

15. How could Bart's experiment be improved?

Better control of variables

Bigger test group

Krusty was told that a certain itching powder was the newest best thing on the market, it even claims to cause 50% longer lasting itches. Interested in this product, he buys the itching powder and compares it to his usual product. One test subject (A) is sprinkled with the original itching powder, and another test subject (B) was sprinkled with the Experimental itching powder. Subject A reported having itches for 30 minutes. Subject B reported to have itches for 45 minutes.

Identify the-

16. Control Group

Receiving old itch powder

17. Independent Variable (What I change)

RECEIVING NEW ITCH POWDER

18. Dependent Variable (What I observe)

Amount of itching

19. Explain whether the data supports the advertisements claims about its product.

NO – NOT ENOUGH DATA

Lisa is working on a science project. Her task is to answer the question: "Does Rogooti (which is a commercial hair product) affect the speed of hair growth". Her family is willing to volunteer for the experiment.

Describe how Lisa would perform this experiment. Identify the control group, and the independent and dependent variables in your description.