Identifying Variables & Designing Investigations

3 Kinds of Variables

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

3 Kinds of Variables

- Dependent Variable – something that might be affected by the change in the independent variable
  - What is observed
  - What is measured
  - The data collected during the investigation

3 Kinds of Variables

- Controlled Variable – a variable that is not changed
  - Also called constants
  - 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.

Identify the variables in this investigation.

What was the independent variable?

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

What was the dependent variable?

- The time it to put the puzzle together
  - The time was observed and measured by the scientist

What was a controlled variable?

- Same puzzle
  - All of the participants were tested with the same puzzle.
  - It would not have been a fair test if some had an easy 30 piece puzzle and some had a harder 500 piece 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.

What are the variables in this investigation?

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

One more:

The higher the temperature of water, the faster an egg will boil.

- Independent variable – temperature of water
- Dependent variable – time to cook an egg
- Controlled variable – type of egg

Last one:

The temperature of water was measured at different depths of a pond.

- Independent variable – depth of the water
- Dependent variable – temperature
- Controlled variable – thermometer

Designing Investigations

The greater the amount of soap in a soap and water mixture, the bigger a soap bubble can be blown.

- Design an investigation to test this hypothesis.
  - Identify the variables
  - What exactly will be changed? How will it be changed?
  - What exactly will be measured? How will it be measured?

Bubble Answers

- Independent Variable – ratio of soap to water
- Dependent Variable – size of bubbles
- Control variables – temperature, soap, bubble maker machine, wind conditions, sun/shade environment…
- Exact ratios will be created, a special machine will be used to create bubbles and the bubbles will be measured as the bubbles burst on a piece of paper spread out in front of the bubble machine. The diameter of 10 bubbles will be measured and recorded for each bubble ratio mixture. A video of the bubble making will also be taken to document the process.

The farther a ball drops, the higher it will bounce.

- Design an investigation to test this hypothesis.
  - Identify the variables
  - What exactly will be changed? How will it be changed?
  - What exactly will be measured? How will it be measured?