Variables

Variables

Anything in the experiment that could be changed and affect the results of the investigation is a variable. Setups of an experiment should have only one variable that is changed at a time. By having only one variable that is changed, you can be fairly certain that the results of the experiment were caused by that one variable. Three types of variables are explained below:

- **Independent variable (One manipulated - CAUSE) -** what the investigator is testing; the **ONE** thing that is changed or manipulated by the scientist.
- **Dependent variable (One responding - EFFECT) –** the response to the independent variable that can be observed (qualitative) and measured (quantitative).
- **Constant variables (many) -** variables (rules) that are kept the same or constant throughout the experiment. They could be changed, but the scientist keeps them constant so that they will not interfere with the investigation.
- **Control (one*) the "norm"*** - A part of the experiment that does not have the variable being tested and is used for comparison. (Not all experiments have a control.)

PRACTICE 1 - Identifying variables: List three variables that could affect the situation.

What variables can affect the number of fish in a lake?

- Variable 1:_____
- Variable 2:_____
- Variable 3:_____

PRACTICE 2 - Three Types of Variables: For the experiment below, specify the independent, dependent, and constant variables.

Students of different ages were given the same puzzle to assemble. The puzzle assembly time was measured.

- Independent variable (manipulated):_____
- Dependent variable (responding):_____
- Constant variables:_____
  _____

Operational Definition

One of the important decisions a scientist must make is to determine how measurement of the variable will be made. The **method used to measure** the **dependent variable** is called an **operational definition.** Once a scientist has decided on a method, that method must be reported to other scientists, so they can test the investigation results. Any scientist can read an operational definition and easily understand or perform the same measurement.

PRACTICE 3 - Think of possible operational definitions for the following problems.

A student wants to test the effect of "Don't Litter" posters on the trash problem at his school. The variable "trash problem" is what the student needs to measure.

- _____
- _____
- _____

A student wants to find out if study affects science grades. The variable "study" and "science grade" must be defined with operational definitions.

- Study:_____
- Science Grade:_____
- Study:_____
- Science Grade:_____

PRACTICE 4 - The following investigation contains operational definitions for a variable. Identify the variables and the operational definitions for the variable.

A study was done to determine the effect of distance running on breathing rate. Students ran different distances and the rate of breathing was measured. One group ran ¼ km, a second group ran ½ km, and a third group ran 1 km. Immediately after running, breathing rate was checked by counting the number of breaths taken in one minute.

- Independent variable (manipulated):_____
- Dependent variable (responding):_____
- Constant variables:_____
  _____
- Operational Definition:_____
  _____
  _____

Science Fair Rubric Checklist – Variables/Operational Definition(s)

Expectations- Variables/Operational Definition(s)	***Points***
▪ Typed/Font 12/Times New Roman/Double-Spaced ▪ Heading (5 lines) – left of page o Title "Science Fair Variables/Operational Definition" ▪ Three or less spelling/grammatical errors ▪ No contractions; no personal pronouns ▪ Independent, dependent, constant variables labeled using colons and semi-colons o Example • Independent: _____ • Dependent: _____ • Constant: _____; _____; _____ ▪ Control variable identified if applicable following above format ▪ Independent and dependent variables identified correctly ▪ All constant variables listed and correct ▪ Operational definition(s) clearly defined and includes unit of measurement ▪ Rubric stapled on front (left corner) ▪ Parent signature on typed assignment	**15**
SCORE	