

OBJECTIVE: Explain the nature of science including key components of the scientific method. (7)

BACKGROUND INFO: Evidence is used to develop theories, generalize data to form laws, and propose hypotheses. Evidence is often gathered through some sort of controlled experiment.

Define the terms and answer the questions.

**Theory** well-tested explanation of things/events based on knowledge gained from repeated observations & investigations

- Can theories change? yes
- List examples from science Theory of Plate Tectonics, Big Bang Theory, Flat Earth Theory

**Law** statement about what happens in nature that seems to be true all the time - tells what, not why or how

- Can laws change? NO
- List examples from science Newton's Laws of Motion, Universal Law of Gravitation, Law of Conservation of (E, mass, momentum), Hubble's Law, Kepler's Laws

### Identifying Variables

A science experiment has three kinds of variables.

- **Independent variable (IV):** Factor the scientist changes in an experiment on purpose.
- **Dependent variable (DV):** What is being measured in an experiment. (changes because of Independent variable)
- **Controlled variable (CV):** Factor that remains constant in an experiment (what you keep the same, often there are many of these in each experiment)

DIRECTIONS: Identify the three variables in the following scenarios.

A. How does the amount of fertilizer used affect the height of a bean plant?

1. The independent variable is amount of fertilizer
2. The dependent variable is height of bean plant
3. The controlled variable(s) is/are temp, sunlight, water, soil...
4. Think about it....How could they change this experiment for next time?

B. How does the pullback distance of a rubber band affect the travel distance of a paper ball?

1. The independent variable is pullback dist of rubber band
2. The dependent variable is travel dist of paper ball
3. The controlled variable(s) is/are rubber band, shape of ball, mass of ball...
4. Think about it....How could they change this experiment for next time?

C. What is something YOU could test? \_\_\_\_\_

1. The independent variable is \_\_\_\_\_
2. The dependent variable is \_\_\_\_\_
3. The controlled variable(s) is/are \_\_\_\_\_

# Data Tables

Name \_\_\_\_\_

Background Information: A group of scientists wanted to see how the amount of fertilizer affected the height of the plant. These scientists understand the importance of multiple trials to get the best results. Fill in the missing information and the data on the table. Then average the trials.

- 2 grams of fertilizer → plant height: 8cm, 7 cm, 9cm
- 4 grams of fertilizer → plant height: 12cm, 10.cm, 11cm
- 6 grams of fertilizer → plant height: 17cm, 16cm, 15cm

	Plant Height ( $\pm 1$ cm)			
Fert. ( $\pm 1$ g)	Trial 1	Trial 2	Trial 3	Average
2	8	7	9	8
4	12	10.	11	11
6	17	16	15	16

Answer the following questions:

5. The independent variable is amount of fert
6. The dependent variable is plant height
7. What happened to the average plant height as scientists increased the amount of fertilizer?  
it increased
8. **Raw Data** = the measurements you record. **Processed data** = "messed with by math" Label the raw data (there are several!) and the processed data.
9. Once we have processed our data, we make a graph to show other people.
10. Can you make your own data table below? You may use Google Sheets to create and screenshot below. Be sure to format correctly. See my Unit 1 Power Point for details.

# Graphs

Name Key

Background Information: A group of scientists wanted to see how the amount of fertilizer affected the height of the plant. These scientists understand the importance of multiple trials to get the best results. The table of their data is below.

Amount of fertilizer ( $\pm .05g$ )	Plant Height ( $\pm .05$ cm)			
	Trial 1	Trial 2	Trial 3	Average
2.00	8.00	9.00	7.00	8.00
4.00	12.00	10.00	11.00	11.00
6.00	17.00	16.00	15.00	16.00

## GRAPHING NOTES

**Axis Labels:** The label on the x-axis (horizontal or side-to-side) is the name of the independent variable. The label on the y-axis (vertical or up and down) is the name of the dependent variable. The dependent variable is graphed on the y-axis, because it "stands on" or "depends on" the independent variable.

**Title:** The format for the title of a graph is: "Dependent variable name vs. Independent variable name."

**Best fit line:** This is a line that best represents the relationship between the variables. The line may pass through some of the points, none of the points, or all of the points.

**Directions:** Make a graph using the table above. (PREFERRED: Go to the Google Store and download "Graphical Analysis" onto your Chromebook to create your graph.) Be sure to format correctly. See my Unit 1 Power Point for details.



