# Scientific Method


**Concept 1:** Observations, Questions & Hypothesis

**PO1:** Evaluate scientific information for relevance to a given problem
**PO2:** Develop questions from observations that transition into testable hypotheses.
**PO3:** Formulate a testable hypothesis
**PO4:** Predict the outcome of an investigation based on prior evidence, probability and/or modeling (not guessing or inferring).

# Steps to the scientific method?

1ST YOU MAKE OBSERVATIONS

2nd ask questions

3rd come up with a possible hypothesis

4th perform your experiment

5th analyze your data

6th make conclusions

# Causal VS Descriptive

- **There 2 types of questions: CAUSAL & DESCRIPTIVE**


- **CAUSAL:**

  -questions into the cause(s) or explanation(s) of a phenomenon by asking "WHY" or "HOW" something happens or the way it is.

- **DESCRIPTIVE:**

  -asks "WHAT", "WHERE", "WHEN", & "WHO" of some observed object, an event or situation.

# WHAT TYPES OF QUESTIONS ARE THESE?

- Why is the sky blue?

  **Causal**

- Who are my lab partners?

  **Descriptive**

- What am I going to learn in this class?

  **Descriptive**

- How does it get so hot in Arizona?

  **Causal**

- When does school start?

  **Descriptive**

- Why do dogs bark?

  **Causal**

# WORKING THE WASHING MACHINE

- It's time for you to do a load of laundry.

- You go to start the washing machine, but nothing happens ☹

**Come up with a causal question & a descriptive question:**

1. Causal:
2. Descriptive:

# WHY WON'T THE WASHER START?

# Causal & Descriptive Practice worksheet! ☺

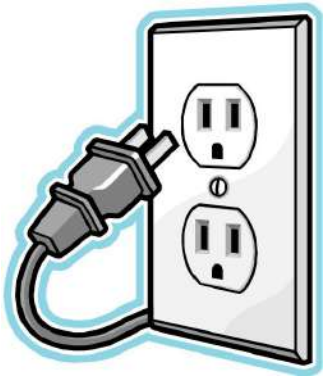

Attach into sci. ntbk

Now come up with

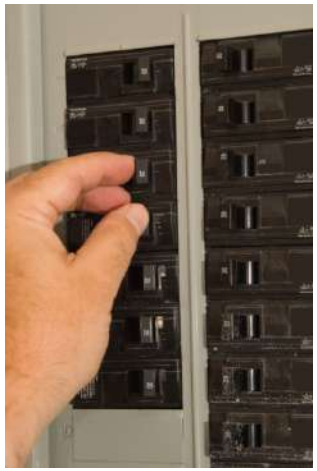
POSSIBLE

reasons why it won't start

it's not plugged in



the circuit breaker is out



there is a wire loose

Those *possible explanations* were….

HYPOTHESES

# WRITING HYPOTHESES

WHAT IS A HYPOTHESIS ANYWAY???

# A Hypothesis is…

A reason supporting / justifying your prediction

It is NOT an educated guess!

# Prediction

What you think will happen

**Prediction + Hypothesis**

**=**

**CLAIM**

# Let's practice making a CLAIM

Scenario 1

Homework and class grades

Make your claim, remember:

CLAIM = (Prediction) + (Hypothesis)

If I do homework my grade will be increase, due to consistent practice of the material

# Let's practice making a CLAIM

Scenario 2

Working out and obesity


Make your claim, remember:

CLAIM = (Prediction) + (Hypothesis)

Working out will decrease obesity because burning calories causes weight loss.

# Claims Practice Worksheet

Handout- in sci. ntbk

# LET'S MAKE A FOLDABLE!

# Experiment Variables

1. **INDEPENDENT VARIABLE**

2. **DEPENDENT VARIABLE**

3. **CONSTANTS**

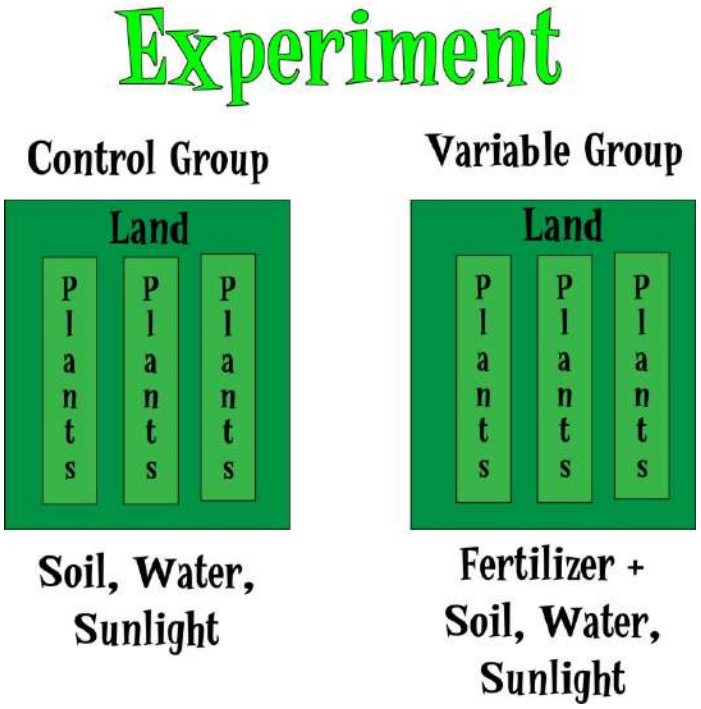
4. **CONTROL GROUP**

FOLDABLE!

# 1. INDEPENDENT VARIABLE (IV)

## The variable that is being CHANGED or MANIPULATED

- Also known as the IV in an experiment.




**In the picture to the left, what is the I.V.?**

(The variable being CHANGED / MANIPULATED)

Fertilizer!

# 2. Dependent Variable: (DV)

The responding variable; the variable that is being MEASURED.

- Also known as the DV in an experiment!

**EXAMPLE**:
**A group of students were given a short course in speed-reading. The instructor was curious if a monetary incentive would influence performance on a reading test taken at the end of the course. Half the students were offered $5 for obtaining a certain level of performance on the test, the other half were not offered money.**

**Independent Variable:** The incentive (money) after a course in speed-reading

**Dependent Variable:** Performance on a reading test

# Independent VS Dependent Variable EXAMPLES:

1. There will be a statistically significant difference in graduation rates of at-risk high school seniors who participate in an intensive study program as opposed to at-risk high-school seniors who do not participate in the intensive study program."

- **IV:**

- **DV:**

Intensive study program

Graduation rate of at-risk high school seniors

# Independent VS Dependent Variable
# EXAMPLES:

A scientist wants to investigate whether plants need sunlight to grow. The hypothesis being tested is:

2. "**Plants require sunlight to grow." The scientist placed one tray of sunflower seedlings in the sun and another tray of sunflower seedlings in a cupboard in the laboratory. The seedlings were watered and after 6 weeks the height of each seedling was measured.**

**I.V. :** The amount of sunlight given to each tray of sunflower seedlings

**D.V. :** The height of each sunflower seedlings after 6 weeks

# 3. CONSTANTS

**All variables that MUST remain the same during the experiment.**

**Mrs. Ellison has a patch of sweet corn behind the school. In the past, she has only planted corn without fertilizer. She wants to see if the sweet corn will grow better with a "fertilizer" from her cat's litter box. Mrs. Ellison plants one row of corn with the "fertilizer" and another row without the fertilizer. Both rows were planted in the same area and in the same type of soil. Both rows were also planted with the same exact type of seed.**

Seed type 2. Soil type 3. Area planted 4. Sun exposure

5. Amount of water given 6. Tools used to plant seeds 7….

# Identifying Variables- Practice

1. Fertilizer in soil increases flower production.

IV:_____, DV: _____, 2 Controls: _____ & _____

2. If zinc tablets are taken, then the number of colds per year is reduced.

IV: _____, DV: _____, 2 Controls: _____ & _____

3. If water is present, then the number of bacteria in garbage bins increases.

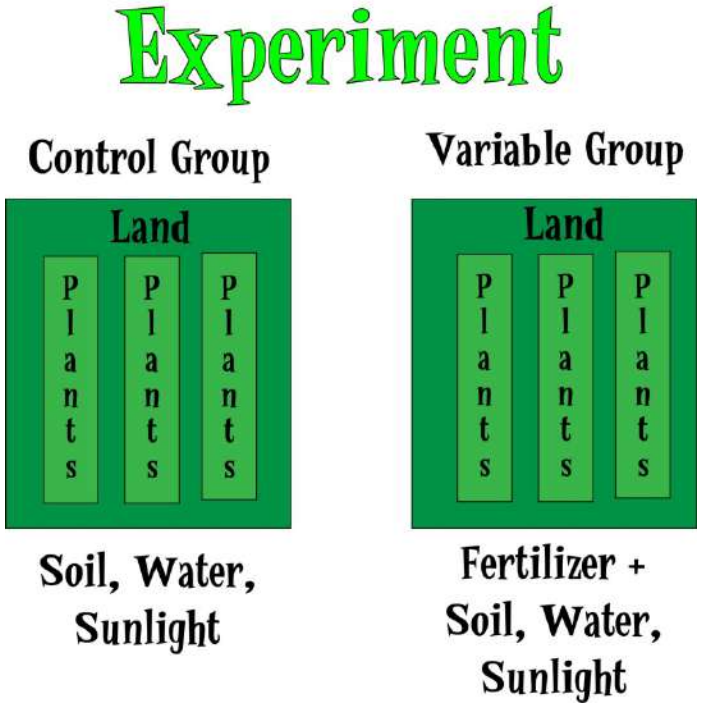
IV: _____, DV: _____, 2 Controls: _____ & _____

**IN YOUR SCIENCE NTBK**

# 4. CONTROL GROUP

A group that is NOT being manipulated or is NOT BEING TESTED by an experimental process.

It is used to compare results to the experimental group.



Kindergarten children will select certain types of food because of its color. Sandy put food coloring into 4 identical bowls of mashed potatoes as follows: Bowl 1 (green), Bowl 2 (red), Bowl 3 (blue), and Bowl 4 (yellow). Each child chose a scoop of potatoes of the color of their choice. Sandy did this experiment using 100 kindergarten students. She recorded the number of students that chose each color.

-Independent Variable:

-Dependent Variable:

-Controlled Variable(s):

Plants compete for space because they need room to grow. Mary bought a mixture of flower seeds and some potting soil. Into each of the 5 plastic cups, she placed the same amount of soil. The following numbers of seeds were placed in each cup: Cup 1 (2 seeds), Cup 2 (4 seeds), Cup 3 (8 seeds), and Cup 4 (16 seeds). In the last cup she planted 32 seeds. After 25 days, she determined which set of plants looked best.

- **Independent Variable:**

- **Dependent Variable:**

- **Constants:**

# SpongeBob Variables Practice!!!