

Scientific Method

Agenda:

*Activity: Prefix/Suffix Worksheet

*Notes: Causal vs. Descriptive Questions

Homework:

Finish Prefix/Suffix Worksheet due
Wed/Thurs 7/30-7/31 for 10 Points

Causal vs. Descriptive Worksheet due
Wed/Thurs 7/30-7/31 for 20 Points



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
☹



Now... COME UP WITH A CAUSAL
QUESTION TO THIS SCENARIO.

WHY WON'T THE WASHER START?



Now come up with

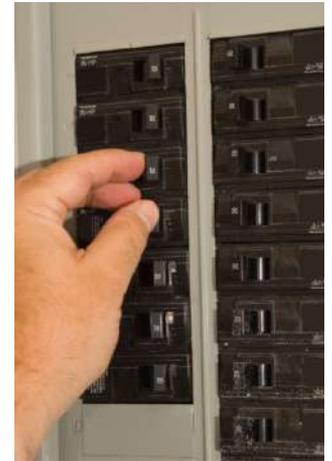
POSSIBLE

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

Agenda:

Scientific Method

*Notes: Writing Hypothesis Statements

*Activity: Hypothesis Practice

*Notes: Variables in an experiment

*Activity: Variables worksheet Practice

Homework:

Hypothesis Practice Worksheet due in class today 7/30-7/31 for 20 Points

Variables Practice Worksheet due Friday 8/1/2014 for 30 Points



WRITING HYPOTHESES

WHAT IS A HYPOTHESIS
ANYWAY???

A Hypothesis is...

A possible explanation that can be tested

It is NOT an educated guess!

Testing A
Hypothesis

EARLY RISER EXAMPLE:

- Jerry is a 1 year old boy who is waking up at 5:00 each morning. As far as his parents were concerned, this was too early.

1. WHAT IS A CAUSAL QUESTION FOR THIS SCENARIO?

2. GIVE A POSSIBLE EXPLANATION

3. HOW WOULD YOU TEST THIS?

- What SHOULD happen if your test is correct?



EARLY RISER EXAMPLE:

- Jerry is a 1 year old boy who was waking up at 5:00 each morning. As far as his parents were concerned, this was too early.

1. WHAT IS A CAUSAL QUESTION FOR THIS SCENARIO?

ANSWER: Why is Jerry waking up at 5 A.M. each morning?

2. GIVE A POSSIBLE EXPLANATION

ANSWER: Jerry is hungry; Jerry needs his diaper changed; The sunlight is waking him up

3. HOW WOULD YOU TEST THIS?

ANSWER: Feed Jerry at a later time, before he goes to bed so he could sleep in later.

Check Jerry's diaper during the night.

Put drapes over the windows so the sunlight will not get through.



Writing a Hypothesis Statement

Hypothesis Statements are written in an
IF....AND...THEN.... FORMAT

IF = HYPOTHESIS (possible explanation)

AND = HOW you will test your hypothesis

THEN = EXPECTED or PREDICTED results

Apply this to the “Early Riser” Example; develop a Hypothesis Statement 😊

Early Riser Example: Hypothesis Statement

Possible Hypothesis Statements:

1. **If** baby Jerry is hungry **and** he is fed at a later time before going to bed, **then** baby Jerry will sleep in later than 5:00 A.M.
2. **If** baby Jerry needs his diaper changed **and** his diaper is checked and changed in the middle of the night, **then** baby Jerry will sleep in later than 5:00 A.M.
3. **If** the sunlight is coming into baby Jerry's room, **and** drapes are put over all of his windows to cover the sunlight, **then** baby Jerry will sleep in later than 5:00 A.M.

“If, and, then...” Practice worksheet



Parts of an experiment?

1. INDEPENDENT VARIABLE

2. DEPENDENT VARIABLE

3. CONSTANTS

4. CONTROL



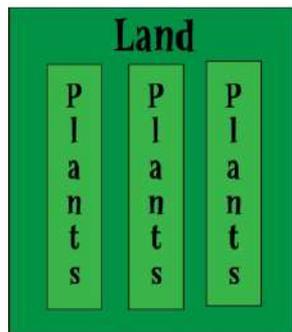
1. INDEPENDENT VARIABLE (IV)

The variable that is being CHANGED or MANIPULATED

- Also known as the IV in an experiment.

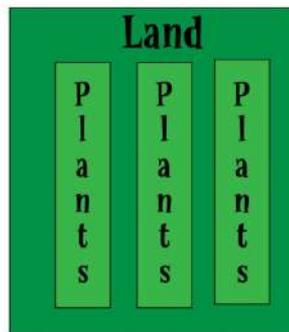
Experiment

Control Group



Soil, Water,
Sunlight

Variable Group



Fertilizer +
Soil, Water,
Sunlight

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

(The variable being CHANGED /
MANIPULATED)

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.

1. 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

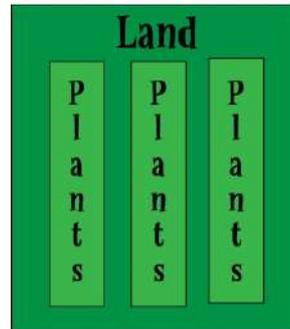
4. CONTROL

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.

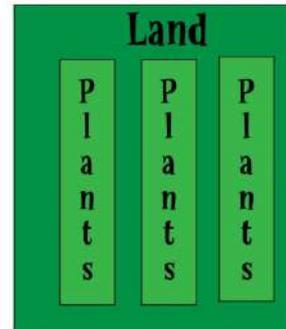
Experiment

Control Group



Soil, Water,
Sunlight

Variable Group



Fertilizer +
Soil, Water,
Sunlight