

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Incoming 7<sup>th</sup> Grade Summer Science Assignment Due September 12, 2018What is the *Experimental Design*?

Some Helpful Vocabulary

**Experimental Design**- describes the manner in which you test your hypothesis through experimentation. Having correct experimental design is CRUCIAL to accurately testing your hypothesis. The stronger your experimental design is, the more reliable your results will be, and the more confident you can be when you draw conclusions from your data.

**Variables**: Scientists use an experiment to search for **cause and effect** relationships in nature. In other words, they design an experiment so that changes to one item cause something else to vary in a predictable way. A variable is any factor, trait, or condition that can exist in differing amounts or types. An experiment usually has three kinds of variables: *independent, dependent, and controlled*.

**Independent Variable**: this variable is changed by the researcher and observations are made to see if the change of the independent variable has an impact on the dependent variables. **Only ONE** independent variable should change in an experiment

**Dependent Variables**: these variables change as a result of the independent variable. The scientist focuses the observations on the **dependent variable** to see how it responds to the change made to the independent variable. The new value of the dependent variable is caused by and depends on the value of the independent variable. This is where your DATA comes from.

**Controlled Variables**: these are Variables in the experiment that you keep the same (YOU MAKE SURE THEY DON'T CHANGE)

**Hypothesis**: This is developed from your question and should be very clear and direct. Every hypothesis needs an Independent Variable and a Dependent Variable, and should be written as an "If...Then..." statement. The hypothesis is NOT A QUESTION but a statement that can either be correct or incorrect. YOUR HYPOTHESIS MUST BE TESTABLE (meaning you can collect data on it!)

**Control Group**: this group does not receive the treatment (no change to independent variable). This group is used to compare to as the "normal" or "baseline".

**Experimental Groups**: this group receives the treatment (change in independent variable)

**Trials**: the # of times you replicate the experiment.

**Data**: anything that can be observed/measured in an experiment. Two types of data: *quantitative and qualitative*.

**Quantitative Data**: anything that can be measured with numbers (24 horses finished the race, Mr. Miller ate 5 pies, the Flyers scored 3.4 goals per game last month, etc.)

**Qualitative Data**: Observations not related to quantities or numbers (examples: the horse is brown, Mr. Miller is drawn', the Flyers are awesome, etc.)

**Example A:** The further you sit from Mr. P, the less chance you will get caught on your phone.

**Hypothesis:** If you sit closer to Mr. P, then you are more likely to get caught with your phone.

**Independent Variable:** Distance of your seat to Mr. P  
w/ phone

**Dependent Variable:** # of times caught

**Control Group:** Back Row

**Experimental Group:** All Rows Closer

**Example B:** 8<sup>th</sup> Grade boys do better on Science tests than girls do.

**Hypothesis:** If you take a Science test and you are a guy, then your score will be higher.

**Independent Variable:** Whether Guy or Girl taking test

**Dependent Variable:** Test Score

**Control Group:** Girls

**Experimental Group:** Guys

**PRACTICE WRITING HYPOTHESES:** Write a hypothesis for each of the statements and identify the variables, control group, and experimental group.

**#1. The Jersey Shore show draws a larger audience than the nightly news.**

Hypothesis: If \_\_\_\_\_, then

\_\_\_\_\_

Independent Variable: \_\_\_\_\_

Dependent Variable:

\_\_\_\_\_

Control Group: \_\_\_\_\_ Experimental Group:

\_\_\_\_\_

**#2. iPhones batteries last longer than Droid's batteries.**

Hypothesis: If \_\_\_\_\_, then

\_\_\_\_\_

Independent Variable: \_\_\_\_\_

Dependent Variable:

\_\_\_\_\_

Control Group: \_\_\_\_\_ Experimental Group:

\_\_\_\_\_

**#3. Ms. Polanco is happier around cats then she is around people**

Hypothesis: If \_\_\_\_\_, then

\_\_\_\_\_

Independent Variable: \_\_\_\_\_

Dependent Variable:

\_\_\_\_\_

Control Group: \_\_\_\_\_ Experimental Group:

\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**#4. Playing football increases the risk of getting a concussion.**

Hypothesis: If \_\_\_\_\_, then

\_\_\_\_\_

Independent Variable: \_\_\_\_\_

Dependent Variable:

\_\_\_\_\_

Control Group: \_\_\_\_\_ Experimental Group:

\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

#5. Make your own problem/statement and fill in the rest...

Problem/

statement \_\_\_\_\_  
\_\_\_\_\_.

Hypothesis: If \_\_\_\_\_, then

\_\_\_\_\_

Independent Variable: \_\_\_\_\_

Dependent Variable:

\_\_\_\_\_

Control Group: \_\_\_\_\_ Experimental Group:

\_\_\_\_\_

## Overview of Scientific Method and Experimental Design

**Step One-** State the Problem (*State the question you are trying to figure out*)

- Identify the *Independent Variable* (*The thing that the you change to look for a result*)
- Identify the *Dependent Variable* (*The thing that the you look at to see if there is a result*)

**Step Two-** Gather Information

- What information can you find about the independent and dependent variables?
- What information can you find about the relationships between both variables?

**Step Three-** Create a Hypothesis

- Make an educated guess (based on your research) about the problem
- State the *hypothesis* using the following format:

“If (put in how you will change the independent variable)...then (put in how you guess the dependent variable will change)”

#### Step Four- Design an Experiment

- Create a valid experiment to test your hypothesis
- Determine exactly how you are going to change your independent variable (ex: adding 6 mentos vs 4 mentos, using coke vs pepsi...)
- Determine what data you are going to record for your dependent variable (ex: geyser height, length of time of geyser...)
- List all of the controlled variables and make sure that you only have ONE independent variable! (changing more than one thing will give inaccurate results)
- Make a step by step (numbered) procedure to follow during the experiment. Include all materials necessary for the experiment in this procedure!
- Create a data chart to write down your data

#### Step Five- Do Experiment and Collect Data

- Carry out the experiment and record your data
- Follow the step by step procedure
- Record your data in the data chart

#### Step Six- Make a Conclusion

- Analyze the results of your experiment to determine if your hypothesis can be accepted (correct) or not accepted (it was incorrect)
- You will consider if the dependent variable changed in the way that you predicted in your hypothesis

### Experimental Design Practice



Smithers thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers and assigns each group the same task (in this case, they're supposed to staple a set of papers). Group A is given the special juice to drink while they work. Group B is not given the special juice. After an hour, Smithers counts how many stacks of papers each group has made. Group A made 1,587 stacks, Group B made 2,113 stacks.

**Directions:** For each of the following identify the:

#### 1. *Control Group-*

2. *Experimental Group*-

3. *Independent Variable* (the thing that Smithers changes)-

4. *Controls* (the things that Smithers leaves the same)-

5. *Dependent Variable* (the thing that you observe/keep data on)-

6. *What should Smithers' conclusion be?*



Homer notices that his shower is covered in a strange green slime. His friend Barney tells him that coconut juice will get rid of the green slime. Homer decides to check this out by spraying half of the shower with coconut juice. He sprays the other half of the shower with water. After 3 days of "treatment" there is no change in the appearance of the green slime on either side of the shower.

1. State the problem that Homer is trying to figure out.

2. Independent Variable (the thing that Homer changes)

3. Controls (the things that Homer leaves the same)

4. Dependent Variable (the thing that you observe/keep data on)

5. What should Homer's conclusion be?



Krusty was told that a certain itching powder was the new best powder on the market, it even claims to cause 50% longer lasting itches. Interested in this product, he buys the itching powder and compares it to his usual product. One test subject (A) is sprinkled with the original itching powder, and another test subject (B) was sprinkled with the Experimental itching powder. Subject A reported having itches for 30 minutes. Subject B reported to have itches for 45 minutes.

Identify the-

1. Control Group-

2. Experimental Group-

3. Independent Variable (the thing that Krusty changes)
4. Controls (the things that Krusty leaves the same)
5. Dependent Variable (the thing that you observe/keep data on)
6. What should Krusty's conclusion be?



Lisa is working on a science project. Her task is to answer the question: "Does Rogooti (which is a commercial hair product) affect the speed of hair growth". Her family is willing to volunteer for the experiment. Create an experiment that could help to answer this question. Include and identify a control group, experimental group, variable and a conclusion.

1. Control Group-
2. Experimental Group-
3. Independent Variable (the thing that Lisa changes)
4. Controls (the things that Lisa leaves the same)
5. Dependent Variable (the thing that you observe/keep data on)
6. What should Lisa's conclusion be?

## Variables in the news

Directions: Read the following articles and identify the variables

### Infants Can Spot a Fake Cry Baby, New Study Shows By [James A. Foley](#)

Oct 17, 2013 12:20 PM EDT

Infants as young as 18-months old are able to analyze body language and facial expressions to determine whether a person's emotions are genuine, according to new research from Concordia University.

Infants can detect whether a person's emotions are justifiable in a particular context, the researchers determined, after placing subjects in front of an actor instructed to present emotional reactions that went with or against certain pantomimed expressions.

"Our research shows that babies cannot be fooled into believing something that causes pain results in pleasure. Adults often try to shield infants from distress by putting on a happy face following a negative experience. But babies know the truth: as early as 18 months, they can implicitly understand which emotions go with which events," said Diane Poulin-Dubois, a psychology professor at Concordia University. She said that the research shows that babies are capable of understanding how the meaning of an experience is directly related to the expression that follows it.

The study tested 92 infants between 15 and 18-months old. In one of the scenarios presented to the babies, an actor would appear to be sad when given a desirable toy, where in another the actor appeared to experience pain and gestured having a hurt finger.

At 15 months, infants did not appear to show a significant difference in reaction to these events. But by 18 months, the infants were clearly able to detect the false emotional acts; they spent more time scrutinizing the actor and more time investigating how others in the room were reacting to the dubious information.

The 18-month-old babies also only showed empathy when the actor rightfully appeared to be in pain or sad.

Sabrina Chiarella, a psychology researcher also involved with the study, said the indiscriminate show of concern to sad faces is an adaptive behavior.

The ability to detect sadness and then react immediately has an evolutionary implication. However, to function effectively in the social world, children need to develop the ability to understand others' behaviors by inferring what is going on internally for those around them."

**When you are done reading go to the computer and watch this video**

Sabrina Chiarella explains her research on how infants can detect emotions in adults. The title of the video is "If you're happy, baby knows it"

<http://youtu.be/c-QLGkj4nFM>

**Then fill out this information and complete worksheet**

1. Control Group-

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\_\_\_\_\_ 2. Experimental Group-

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\_\_\_\_\_ 3. Independent Variable (what the scientist changes)

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\_\_\_\_\_ 4. Controls (what the scientist leaves the same)

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\_\_\_\_\_ 5. Dependent Variable (the thing that you observe/keep data on)

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6. What is the conclusion?

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