

# You Really “Affect” Me

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## GRADE LEVELS:

6-8

## TIME ALLOTMENT:

Two-48 minute class periods

## OVERVIEW:

This lesson is designed to help students differentiate between an independent and dependent variable as well as a constant. They will first be introduced to the topic with a short video lesson. This activity is followed by an interactive internet-based activity. The final portion of this lesson will be a hands-on activity where they will practice what they have learned.

## SUBJECT MATTER:

Science

## LEARNING OBJECTIVES:

Students will be able to:

- Define variables
- Identify dependent variables, independent variables, and constants
- Control variables to test hypotheses and trials are repeated

## STANDARDS:

The objectives listed above may be used in part to address the following Virginia State Standards available online at

<http://www.pen.k12.va.us>

1. The student will plan and conduct investigations in which:

- Variables are defined
- Dependent variables, independent variables, and constants are Identified
- Control variables to test hypotheses and trials are Repeated

(This lesson addresses Va. SOL L.S. 1)

## MEDIA COMPONENTS:

Video: 3-2-1 Classroom Contact: *How Do You Know? Experiment*

Web Site:

Cannon Experiment

<http://jersey.uoregon.edu/vlab/Cannon/index.html>

This site provides an interactive screen that allows students to measure the relation between muzzle velocity, gravitational potential and the effects of frictional drag caused by wind speed blowing opposite to the direction the projectile is moving in.

In the following lesson, this interactive site has been adapted to show the relationship that exists when variables are substituted. When they are, students will identify the ones that affect the cannon ball's distance and accuracy. Students will be able to answer the following questions: What variables stay the same? What are the variables called?

## MATERIALS:

Materials needed for Introductory Activity

- Television
- VCR
- Video: 3-2-1 Classroom Contact #129

Materials needed for Learning Activity for each group of four students:

- Computer
- One copy of the four handouts entitled “DATA COLLECTION SHEET #1, 2, 3 & 4
- Vocabulary list

Materials needed for Culminating Activity for each group of four students

- 1 tray and lid (Plastic see through cake containers work great. You can get these at a bakery.)
- flashlight with batteries
- 2 live earthworms
- stopwatch or clock
- enough paper towels to line the bottom and sides of the tray
- water to moisten the paper towels

### PREP FOR TEACHERS:

1. Prior to teaching this unit, bookmark web site. Take the time to cue your videotape to the first viewing segment. Photocopy all student handouts for distribution, since they are needed during the lesson.
  2. Please go through the instructions, as a student would, from the student materials handouts to make certain you are familiar with the format of the lesson prior to class use.
- When using media, always provide students with a FOCUS FOR MEDIA INTERACTION, a specific task to complete and/or information to identify during or after the viewing of video segments, web sites, or other multimedia.
  - Students should have been introduced to all components of the scientific method prior to this lesson.

### INTRODUCTORY ACTIVITY:

#### SETTING THE STAGE

1. Provide students with a **Focus for Media Interaction**. Say: “Students, I’m going to play a segment of a video. You will witness a conversation between a girl and a boy. I want you to tell me at the end of the segment ‘what is it that the boy is able to do that amazes the girl?’ ” **Start 3-2-1 Classroom contact #129** just after the opening credits where

you see the words “How Do You Know? Experiment”

2. **Pause** after the words “OK, maybe you’re right, but let’s prove it.” Ask, “What is it that the boy is able to do that amazes the girl?” (*He recognized Charlie’s voice from only six words*)
3. **PROVIDE YOUR STUDENTS WITH A FOCUS FOR MEDIA INTERACTION**, saying, “Watch this next segment and tell me two things: ‘What does the girl plan to do about the boy’s claim, and what is a controlled experiment?’ ” **RESUME**, then **PAUSE** when girl says: “...all the time as a way to test their theories”. Ask: What does the girl plan to do about the boy’s claim? (*She plans on doing a controlled experiment*) What is a controlled experiment? (*That’s when you eliminate all the things that could change the results of the experiment except for the one thing you are testing for.*)
4. **Fast Forward** to picture of sheep grazing at the river and **Pause**. **PROVIDE YOUR STUDENTS WITH A FOCUS FOR MEDIA INTERACTION**, saying, “Again, I have two questions I want you to answer for me. When this next segment is over (What type of experiment does the girl design to test the boy’s ability to recognize Charlie’s voice without any clues, and how many times will she test him?). **Resume**, then **Pause** when boy says “voice #3, definitely.) Ask, “What experiment did the girl design to test the boy’s ability to recognize Charlie’s voice without any clues?” (*She tapes Charlie’s voice along with two other boys, Charlie’s age, on a video camera saying “Hi it’s me”. The boy can only hear the tape. How many times will she test him? (He gets 12 tries to identify Charlie’s voice.)*)

5. **Fast Forward** to where a parrot is sitting on a girl's shoulder and says "I'm going to go eat lunch" then **Pause**. **PROVIDE YOUR STUDENTS WITH A FOCUS FOR MEDIA INTERACTION**, saying, "In this next segment, listen for two things: (How many times did the boy identify Charlie's voice from the other two, and how many times could he have picked Charlie's voice if he was just guessing.)" **Resume**, then **Stop** the video when the girl says: "You could get it right four times even if you guessed." Ask, "How many times did the boy identify Charlie's voice from the other two?" (*Three times.*) How many times could he have picked Charlie's voice if he as just guessing? (*Four times.*)
6. **PROVIDE YOUR STUDENTS WITH A FOCUS FOR MEDIA INTERACTION**, saying, "In this last segment, what is it that the boy admits?" **Start**, then **Stop** the video when boy says, "How did I know it was Charlie?" Ask, "What did the boy admit? (*He was not able to identify a voice without some other clues.*) Lead students into a discussion about variables.

### LEARNING ACTIVITIES

1. Ask your students the following questions:  
 "What was it that the girl was testing?" (*A variable*)  
 "What is a variable?" (*Factor being tested in an experiment.*)  
 Say, "There are two types of variables that we are going to study today: one is the **Independent variable** (IV) and the other is the **Dependent variable** (DV). The independent variable is what is Changed in the experiment. The dependent variable is what Changes as a result of the experiment."

#### Give examples:

IV: Food coloring added to water;  
 DV: the rate of evaporation  
 IV: Fertilizer added to plants;

- DV: height of plants  
 IV: Various colored waters  
 DV: heat absorption  
 IV: Music  
 DV: chickens lay more eggs  
 IV: Aspirin  
 DV: preserve life of carnation
2. Have the students break into computer groups of four. Give each group the following worksheets: DATA COLLECTION SHEET #1, #2, #3, #4 and vocabulary handout. Have students go on-line to the Cannon Experiment that you have bookmarked:

<http://jersey.uoregon.edu/vlab/Cannon/index.html>

**FOCUS FOR WEB INTERACTION:** In order to work through this interactive activity, have students follow the instructions on the worksheet and not the directions at the site. Teacher should go from group to group as each group finishes a worksheet. (*Note: Have students refer to vocabulary sheet if they are unfamiliar with any of the terms at the web site.*)

When students have completed this interactivity, that should draw the following conclusions:

- ☉ One variable at a time should be manipulated.
- ☉ Variables are dependent upon each other.
- ☉ Changing one variable affects outcomes.
- ☉ Students should be able to identify Independent and Dependent variables.

### CULMINATING ACTIVITY

1. Say, "Yesterday we learned the difference between **independent and dependent variables**."
2. Today you will apply this knowledge in the following exercise. Have students break into groups of four. Students will experiment with earthworms to identify independent and dependent variables.
3. Have students brainstorm about what worms need to survive. Make a list:

- food, water, soil, temperature, light, etc. Pick one variable to test: **light**.
4. Give each group of four one tray, 2 pieces of cardboard that are cut a little larger than the tray, paper towels to cover inside bottom of tray and sides, water and two earthworms.
  5. Line bottom and sides of tray with paper towel. Moisten slightly to keep the worms from drying out during the experiment.
  6. Decide how long you will wait for the worms to move to the left or right side of the tray. Place two earthworms in the middle of the tray and cover with a piece of cardboard. Wait the designated amount of time (2-5 minutes). Record your results. This will serve as your control.
  7. Repeat this experiment, but this time cut a hole in the other piece of cardboard to allow light to pass through. The hole should not be larger than a dime. It can be smaller.
  8. Turn off lights, shine the flashlight down through the hole, and wait the same amount of time. Record your data and compare with the control experiment.
  9. Ask, "What was the independent and the dependent variable?". (*Light is the independent variable, and the movement to the left or right would be the dependent variable.*) Ask, "What (temperature, moisture, space, time, etc.) stayed the same?"

### **ASSESSMENT**

1. Students will design their own experiment on paper and identify the constants, independent variable and dependent variable.
2. Allow students to choose another variable in the worm experiment to test. They will write up the experiment and identify the independent variable, dependent variable and the control.

### **CROSS-CURRICULAR EXTENSIONS**

#### **English**

- Write a "tall tale" about a person being shot out of a cannon in the circus.

#### **Math**

- Graph the data collected in the cannonball experiment.

#### **History**

- Research the development of the cannon and its uses in the military.

#### **Technology**

- Students could create a PowerPoint presentation of an experiment.

### **COMMUNITY CONNECTIONS**

1. Students could visit their local water treatment plant and see how different amounts of chemicals effect the purification of water.
2. Students could invite a medical professional to the classroom to discuss how experimental drugs are tested and rated as to their effectiveness.