

Identifying Independent and Dependent Variables in Experiments

Physical Science

Name:

Date:

Period:

Goal: To demonstrate student understanding of independent and dependent variables

Procedure - Part I: Identify the dependent and independent variable in each of the eight investigations below. Remember the following definitions:

INDEPENDENT VARIABLE	The factor manipulated (or changed) by the scientist. This might also be described as the change made by the experimenter <i>on purpose</i> .
DEPENDENT VARIABLE	The factor (or result) which changes because of what the scientist does. The dependent variable is the change that occurs <i>because</i> of what the experimenter does; it gets changed by the independent variable. It is sometimes called the responding variable. This is the variable that the scientist measures because it is changed as a result of the IV.

Example: You are investigating how soil type influences bean stem growth. In your investigation...

- a. Independent variable (the variable that you are changing) is types of soil used.
- b. Dependent variable (the results) would be the growth of bean stems.

1. Is plant growth affected by the color of light in which it grows?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:
2. Which laundry detergent removes stains more effectively?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:
3. Does the type of oil affect the size of popcorn?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:
4. Which type of paper towel is more absorbent?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:
5. Which battery has the longest life span?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:
6. Which paint resists weathering more effectively?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:
7. Do different types of music affect student math accuracy?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:
8. How do different salts affect the melting point of ice?
 - a. Independent variable:
 - b. Dependent variable:
 - c. Some Controlled variables:

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Part II: Evaluation

1. Explain how you know which variable in an experiment is the independent variable.

2. What question can you ask to help you identify the dependent variable?

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Identifying Independent & Dependent Variables

Goal: To demonstrate student understanding of independent and dependent variables

Procedure - Part I: Identify the dependent and independent variable in each of the eight investigations below. Remember the following definitions:

INDEPENDENT VARIABLE	The factor controlled (or changed) by the experimenter. This might also be described as the change that I, the experimenter, makes <i>on purpose</i> . It is sometimes called the <i>manipulated variable</i> .
DEPENDENT VARIABLE	The factor (or result) which changes because of what the experimenter does. The dependent variable is the change that occurs <i>because of</i> what the experimenter does; it gets changed by the independent variable. It is sometimes called the <i>responding variable</i> . It usually is measured in some manner.

1. What is the effect of scary movies on pulse rate?
 - a. Independent variable:
 - b. Dependent variable:
2. What is the effect of heat on ice melting?
 - a. Independent variable:
 - b. Dependent variable:
3. What is the effect of different types of oil on the amount of time it takes for the gears to reach a temperature of 30°C?
 - a. Independent variable:
 - b. Dependent variable:
4. What is the effect of higher levels of calcium on dendrite synapse relay time?
 - a. Independent variable:
 - b. Dependent variable:
5. Which restaurant has the least amount of *Escherichia coli* (bacteria) in their rice.
 - a. Independent variable:
 - b. Dependent variable:
6. The most expensive air freshener will kill the least number of bacteria.
 - a. Independent variable:
 - b. Dependent variable:
7. What is the effect of trajectory angle on distance traveled?
 - a. Independent variable:
 - b. Dependent variable:
8. Increased levels of pollution will increase the number of mutations in frogs.
 - a. Independent variable:
 - b. Dependent variable:
9. Sodium Chloride will dissolve the fastest in water at a temperature of 100°C.
 - a. Independent variable:
 - b. Dependent variable:
10. Listening to Jazz music will increase science test grades.
 - a. Independent variable:
 - b. Dependent variable:
11. Longer school days will result in improved student grades.
 - a. Independent variable:
 - b. Dependent variable:

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Hair Coloring Experiment

We test a new brand of red hair coloring (Red Hair Paint) on 6th grade students at Beville Middle School to see how well the coloring "takes" and lasts on different colors of hair. We compare "Red Hair Paint" to a popular brand already being used, L'Oreal. We test both brands of coloring on 40 students (10 blonds, 10 brunettes, 10 with black hair and 10 with red hair)...some with straight hair and some with curls. The students use the coloring for two months, under identical washing and combing conditions and in the same kinds of environments (temperature, humidity, etc). Identify the following:

INDEPENDENT VARIABLE	
LEVELS OF THE INDEPENDENT VARIABLE	
DEPENDENT VARIABLE	
CONSTANTS	
CONTROL	
REPEATED TRIALS	
EXPERIMENTAL GROUP (what we are testing it on)	

Does Salt Affect Boiling Point of Water?

A student wonders if adding salt to fresh water will change the temperature at which the water boils. In her kitchen, she puts 1L of fresh water into 2 pans (one pan is large, the other is small), then adds 50 grams of salt to the water in the small pan. She places both pans on the stove, uses a thermometer to obtain their starting temperatures and then turns both heating elements to the same high temperature. She continues to monitor the water temperatures in both pans of water until they both boil. Identify the following parts of the experimental design process.

INDEPENDENT VARIABLE	
LEVELS OF THE INDEPENDENT VARIABLE	
DEPENDENT VARIABLE	
CONSTANTS	
CONTROL	
REPEATED TRIALS	
EXPERIMENTAL GROUP (what we are testing it on)	

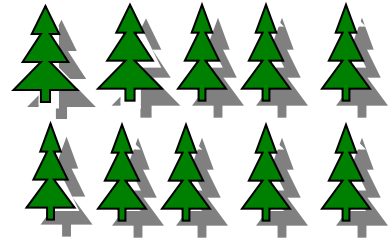
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Experimental Procedure

You are conducting an experiment designed to investigate the effect of chemicals upon plants.

Two groups of plants (Group 1 and Group 2) were planted in identical pots, with identical soils, in identical lighting and temperature environments, receiving identical amounts of water and fertilizer. Every day Group 2 plants also received small, measured amounts of acid mixed with the water that they received.



Identify the following items:

1. Constants:
 2. Control Group (if there is one):
 3. Independent Variable
 4. Dependent Variable
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SpongeBob Clean Pants

Worksheet created by T. Trimble, 2003 <http://sciencespot.net/>

SpongeBob noticed that his favorite pants were not as clean as they used to be. His friend, Sandy, told him that he should try using Clean-O detergent, a new brand of laundry soap she found at Sail-Mart. SpongeBob made sure to wash one pair of pants in plain water and another pair in water with the Clean-O detergent. After washing both pairs of pants three times each, the pants washed in the Clean-O detergent did not appear to be any cleaner than the pants washed in plain water.

Answer the following questions:

1. What was the problem SpongeBob wanted to investigate?
2. What is the independent variable?
3. What is the dependent variable?
4. What should be SpongeBob's conclusion?

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Squidward's Symphony

Worksheet created by T. Trimple, 2003 <http://sciencespot.net/>

Squidward loves playing his clarinet and believes it attracts more jellyfish than any other instrument he has played. In order to test his hypothesis, Squidward played a song on his clarinet for a total of 5 minutes and counted the number of jellyfish he saw in his front yard. He played the song a total of 3 times on his clarinet, and then repeated the experiment using a flute and a guitar. He also recorded the number of jellyfish he observed when he was not playing an instrument. The results are shown in the chart.

Number of Jellyfish Attracted By Each Instrument				
Trial	Without Music	Clarinet	Flute	Guitar
1	5	15	5	12
2	3	10	8	18
3	2	12	9	7

1. What is the independent variable?
 2. What is the dependent variable?
 3. What should be Squidward's conclusion?
 4. Are the results reliable? Why or why not?
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Super Bubbles

Worksheet created by T. Trimple, 2003 <http://sciencespot.net/>

Patrick and SpongeBob love to blow bubbles! Patrick found some Super Bubble Soap at Sail-Mart. The ads claim that Super Bubble Soap will produce bubbles that are twice as big as bubbles made with regular bubble soap. Patrick and SpongeBob made up two samples of bubble solution. One sample was made with 5 oz. of Super Bubble Soap and 5 oz. of water, while the other sample was made with the same amount of water and 5 oz. of regular bubble soap. Patrick and SpongeBob used their favorite bubble wands to blow 10 different bubbles and did their best to measure the diameter of each one. The results are shown in the chart.

Bubbles (Diameter in centimeters)		
Bubble	Super Bubble Soap	Regular Bubble Soap
1	15	10
2	10	5
3	12	16
4	18	14
5	22	11
6	13	12
7	16	11
8	18	15
9	15	13
10	12	6

1. What did the Super Bubble ads claim?
2. What is the independent variable?
3. What is the dependent variable?
4. Look at the results in the chart.
5. Calculate the average diameter for each bubble solution.
 - a. Super Bubble = _____ cm
 - Regular Soap = _____ cm
- b. What should be their conclusion?
6. Are the results reliable? Why or why not?