

Independent and Dependent Variables

(summarized from: http://nces.ed.gov/nceskids/help/user_guide/graph/variables.asp)

An **independent variable** is a variable that isn't changed by the other variables you are trying to measure. For example, someone's age might be an independent variable. Other factors (such as what they eat, how much they go to school, how much television they watch) aren't going to change a person's age. In fact, when you are looking for some kind of relationship between variables you are trying to see if the independent variable causes some kind of change in the other variables, or dependent variables.

A **dependent variable** is something that depends on other factors. For example, a test score could be a dependent variable because it could change depending on several factors such as how much you studied, how much sleep you got the night before you took the test, or even how hungry you were when you took it. Usually when you are looking for a relationship between two things you are trying to find out what makes the dependent variable change the way it does.

Many people have trouble remembering which the independent variable is and which the dependent variable is. An easy way to remember is to insert the names of the two variables you are using in this sentence in the way that makes the most sense. Then you can figure out which is the independent variable and which is the dependent variable:

“(Independent variable) may cause a change in (Dependent Variable) and it isn't possible that (Dependent Variable) could cause a change in (Independent Variable)”.

For example: “(Amount of sunlight) may cause a change in (plant growth) and it isn't possible that (plant growth) could cause a change in (amount of sunlight)”.

We see that "amount of sunlight" must be the independent variable and "plant growth" must be the dependent variable because the sentence doesn't make sense the other way around.

Sample answer for Example 1: LISELL Lesson Starters: Controlling Variables in Experiments

1) Preserving Apples

eg. Example ①

1. Independent Variable: type of preservative
2. Dependent Variable: Speed of browning of the apple slices
3. Other variables that must be controlled:
 - size of apple slices (surface area)
 - type of apple
 - amount (volume) of preservative
 - time after slicing that apple slices are placed in the preservative
 - temperature of apples and preservative
 - amount of sunlight + air flow

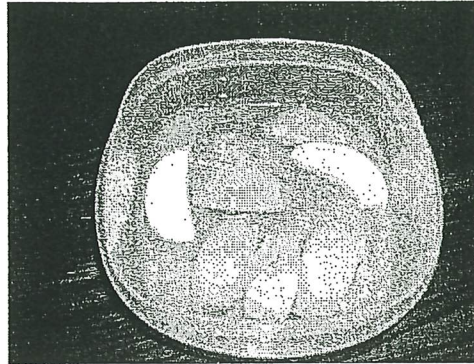
Must be the same for every trial

1

LISELL Lesson Starters Controlling Variables in Experiments

Preserving Apple Slices

Leticia wants to know how fast apple slices will turn brown after being soaked in different preservatives, such as lemon juice, fruit freshener, and Sprite.



Work with a partner to write the following:

- 1) What is the **independent variable** in Leticia's experiment?
(Remember that the independent variable is the variable that you change or manipulate)
- 2) What is the **dependent variable** in Leticia's experiment? (Remember that the dependent variable is the variable that changes in response to the independent variable)
- 3) List 2 other variables that Leticia will need to **control** in her experiment. (Remember that to control a variable means to keep it from changing)

~~4) Use scientific language to describe the experiment that Leticia could perform to answer her question.~~

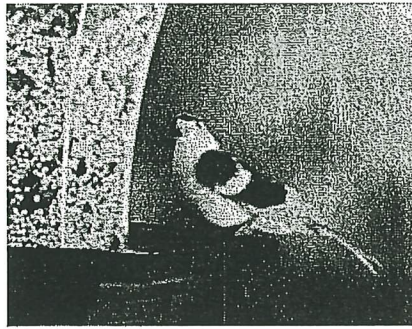
~~Think about the way we express variables in science your variables should be stated as something you could observe or measure.~~

2

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Seeds for Birds

Maria has three types of food that she can put in her bird feeder: sunflower seeds, dried corn and peanuts. She wants to know which type of food will attract the most birds.



Work with a partner to write the following:

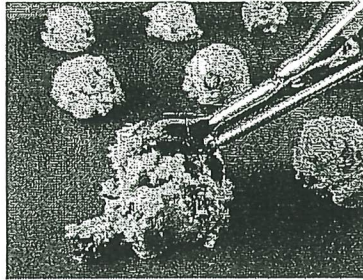
- 1) What is the **independent variable** in Maria's experiment?
(Remember that the independent variable is the variable that you change or manipulate)
- 2) What is the **dependent variable** in Maria's experiment? (Remember that the dependent variable is the variable that changes in response to the independent variable)
- 3) List 2 other variables that Maria will need to **control** in her experiment. (Remember that to control a variable means to keep it from changing)
- ~~4) Use scientific language to describe the experiment that Maria could perform to answer her question.
Remember that your variables should be stated as something you could observe or measure~~

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Baking Cookies

Freddy wants to know if the size of a cookie **determines** how long it needs to bake. He decides to do an experiment to find out.



Work with a partner to write the following:

1) What is the **independent variable** in Freddy's experiment?

(Remember that the independent variable is the variable that you change or manipulate)

2) What is the **dependent variable** in Freddy's experiment?

(Remember that the dependent variable is the variable that changes in response to the independent variable)

3) List 2 other variables that Freddy will need to **control** in his experiment. (Remember that to control a variable means to keep it from changing)

~~4) Use **scientific language** to describe the experiment that Freddy could perform to answer his question.~~

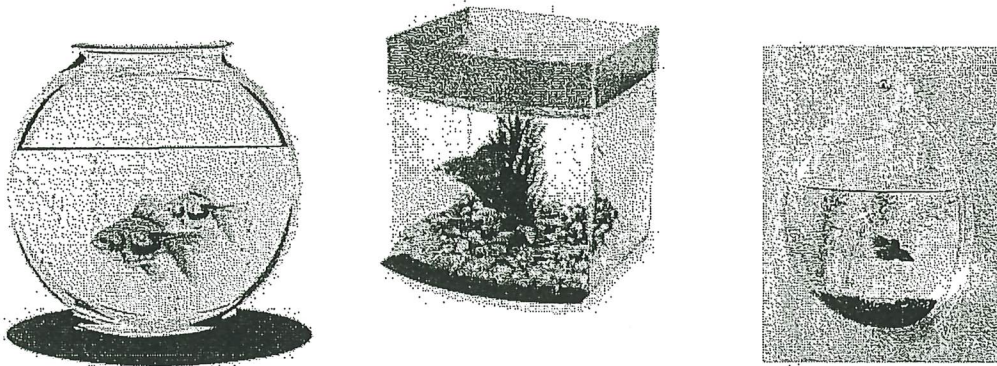
~~Remember that your variables should be stated as something you could observe or measure.~~

4

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Evaporating Water

Juan has three fish bowls of different shapes. He is going on vacation and needs to **decide** which fish bowl to leave his fish in. He wants to know if the water in the fish bowls will evaporate at different **rates**.



Work with a partner to write the following:

- 1) What is the **independent variable** in Juan's experiment? (Remember that the independent variable is the variable that you change or manipulate)
- 2) What is the **dependent variable** in Juan's experiment? (Remember that the dependent variable is the variable that changes in response to the independent variable)
- 3) List 2 other variables that Juan will need to **control** in his experiment. (Remember that to control a variable means to keep it from changing)
- ~~4) Use scientific language to describe the experiment that Juan could perform to answer her question.
Remember that your variables should be stated as something you could observe or measure.~~



LISELL Lesson Starters Controlling Variables in Experiments

Exercise

It is well known that regular exercise and healthy fitness **practices** can help you live longer. Some scientists think that regular exercise may have other **benefits** for young people. For example, a recent study of nearly 2 million students in Texas schools found that students who scored high on a cardiovascular fitness test were more likely to have better school attendance, to do better **academically**, and to have fewer disciplinary referrals than students who scored low on the fitness test. In other words, there are both short-term and long-term benefits to getting regular exercise as a young person and then sticking with it.



Work with a partner to write the following:

- 1) What was the **independent variable** in the experiment on students in Texas? (Remember that the independent variable is the variable that you change or manipulate)
- 2) What were the three **dependent variables** in the experiment on students in Texas? (Remember that the dependent variable is the variable that changes in response to the independent variable)
- 3) List 2 other variables that the scientists should try to **control** in this experiment. (Remember that to control a variable means to keep it from changing)

Remember that your variables should be stated as something you could observe or measure.

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LISELL Lesson Starters Controlling Variables in Experiments

Bottled Water versus Tap Water

Throughout the world, bottled water has become **increasingly** popular in recent years. People see many **benefits**. Besides being convenient, many people think bottled water is purer, safer, and better tasting than tap water from the sink. These ideas may largely be a result of advertising, which shows that bottled water comes from crystal clear mountain springs or the run-off of pure glacial water.

A group called the Natural **Resources** Defense Council (NRDC) decided to **conduct** an experiment to see if bottled water sold in the United States is actually purer and better tasting than tap water in this country. In a four-year study, the NRDC tested the chemistry of over 103 different brands of bottled water. They also conducted blind taste tests to see if people could tell the difference between bottled water and tap water.



Work with a partner to write the following:

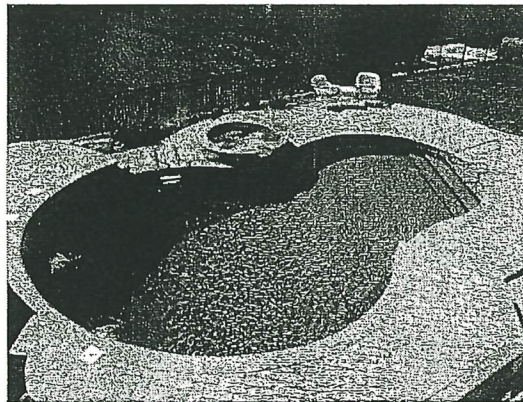
- 1) What was the **independent variable** in the experiment on comparing water samples?
- 2) What were the two **dependent variables** in the experiment on comparing water samples?
- 3) List 2 other variables that the scientists would have tried to **control** in this experiment.

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Chlorinated Water

Using chlorine to kill microbes has a long history, both in swimming pools and in drinking water (the amount of chlorine added to drinking water is **significantly** lower than the amount added to swimming pools). It was more than 100 years ago, in 1908, that chlorine was first added to a city's drinking water to destroy germs. The city was Jersey City, New Jersey, and the person responsible for this **innovation** was a scientist named Harriette Chick. Dr. Chick was the first woman scientist to work at England's famous Lister **Institute**, where **research** is done on the causes, prevention, and treatment of diseases. Harriette Chick did experiments on the **factors** that **affect** how disinfectants, such as chlorine, kill germs. Thus, she was able to determine how much chlorine would be needed to add to water under certain conditions to make it safe to drink (or to swim in).



Work with a partner to write the following:

- 1) What was the **independent variable** in Dr. Chick's experiments on disinfecting water with chlorine?
- 2) What was the **dependent variable** in Dr. Chick's experiments on disinfecting water with chlorine?
- 3) List 2 other variables that Dr. Chick would have tried to **control** during her experiments.

Remember that your variables should be stated as something you could observe or measure.