# Parts of an Experiment

Every experiment has specific parts that can be identified by students. These different parts can all be checked off during the design phase of an experiment. If all the parts of the experiment have been accounted for and considered carefully before the experiment is started it is more likely to be a successful and beneficial experience for the student.

## Hypothesis

A **hypothesis**, which is often in the form of an if/then statement, is what you expect to happen in an experiment. The primary trait of a hypothesis is that something can be tested and that those tests can be replicated. Upon analysis of the results, a hypothesis can be rejected or modified, but it can never be proven to be correct 100 percent of the time.

## Independent Variables

The **independent variable** is the variable that is intentionally changed in the experiment.
The **levels of the independent variable** are the different values of the independent variable, such as using water at 10°, 20°, 30°, 40°, and 50° C. The levels of the independent variable can also be thought of as the experimental groups that are set up.

## Dependent Variables

The **dependent variable** is the variable that responds to the changes in the independent variable. For example, if a student were to measure how fast an effervescent tablet dissolves in water, the independent variable could be the temperature and the dependent variable would be the time it takes for the tablet to dissolve.

## Control

The **control** is the standard against which the researcher compares the results from each treatment group (level) in the experiment. For example, the control might be the room temperature water, which is about 20° C. In many cases, there will not be a true control. The researcher could then set one of the groups as the standard and measure the other groups against that standard.

## Constants

**Constants** are the things that are kept the same each time one of the trials in the experiment is repeated. For example, constants could include the amount of water used, the brand of effervescent tablet used, the type of water used, and the fact that the water was not stirred. As many outside factors as possible should be kept constant in an experiment so that the researcher can be sure that any changes that occur do so because of the independent variable.

## Repeated Trials

The **repeated trials** are the number of times the experiment is repeated to determine how the independent variable affected the results. If 10 different plants are used for each treatment, then there are 10 repeated trials.

## Bias

When proper scientific procedure is undermined by conflicting goals so that it results in deception, we say it is **biased**. This form of bias is common in advertising - companies universally advocate their products, emphasizing product assets while concealing product faults.

## Theory

A scientific theory summarizes a hypothesis or group of hypotheses that have been supported with repeated testing. If enough evidence accumulates to support a hypothesis, it moves to the next step—known as a **theory**.

## Qualitative vs Quantitative

**Quantitative** data is anything that can be expressed as a number or quantified. For example, scores on achievement tests, number of hours of study, or weight of a subject. **Qualitative** data cannot be expressed as a number. For example, gender, socieo economic status, or opinions about the topic.

# Simpsons Experimental Design Practice

Smithers thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers each 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.

1. Constants _____
2. Independent Variable _____
3. Dependent Variable _____
4. What should Smithers' conclusion be? _____
   _____
5. How could this experiment be improved? _____

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 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.

6. What was Homer's initial observation?_____
7. Control Group _____
8. Independent Variable _____
9. Dependent Variable _____
10. What should Homer's conclusion be? _____
    _____

Bart believes that mice exposed to microwaves will become extra strong (maybe he's been reading too much Radioactive Man). He decides to perform this experiment by placing 10 mice in a microwave for 10 seconds. He compared these 10 mice to another 10 mice that had not been exposed. His test consisted of a heavy block of wood that blocked the mouse food. he found that 8 out of 10 of the microwaved mice were able to push the block away. 7 out of 10 of the non-microwaved mice were able to do the same.

11. Control Group _____
12. Constants _____
13. Independent Variable _____
14. Dependent Variable _____
15. What should Bart's conclusion be? _____
    _____
16. How could Bart's experiment be improved? _____

Krusty was told that a certain itching powder was the newest best thing 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.

17. Control Group _____
18. Independent Variable _____
19. Dependent Variable _____
20. Explain whether the data supports the advertisements claims about its product. _____
    _____