

The Scientific Method

"It's how we do" – every scientist ever

The scientific method is a process that scientists follow in order to answer questions about the world around us.

Big deal. **WHY** should I follow this so called "process"?

- It ensures that your experiment will actually _____ your question
- It shows the world how you _____ your results
- It allows other scientists to _____ your experiment to support/disapprove your conclusions
- It allows other scientists to _____ on your research.

Okay that makes sense. So **HOW** is it done?

| | | |
|----------|---|--|
| 1 | What do you want to know or explain? Use observations/research you have made to write a question that address the problem or topic you want to investigate. | |
| 2 | What do you think will happen? Predict the answer to your question or the outcome of the experiment? | |
| 3 | How will you test your hypothesis? Develop a procedure (including all supplies) for a reliable experiment and address safety rules. | |
| 4 | Follow the steps in your procedure to perform your experiment. Collect and record data and observations | |
| 5 | Review the data you collected. Look for averages and patterns. Drawing graphs and doing calculations typically helps. | |
| 6 | Is the data reliable? Would you get the same data if you kept repeating the experiment? Does your data support your hypothesis? Should parts of the method be re-written so that more reliable data could be collected? | |
| 7 | Give suggested improvements to the method. Also suggest some extensions that could be tested in your next experiment | |

Components of an Experiment

Variables

| Definition | Term | Example |
|--|------|---------|
| The variable that is manipulated by the investigator. In other words what you change to see the effect(s) on the other variables. | | |
| The variable that changes as a result of the independent variable. It is usually the factor being measured by the investigator. | | |
| These are the variables the are kept constant in all trials so that any results can be connected solely to the effects of the independent variable | | |

Hypothesis: If _____ then _____ because _____

Identifying Variables Practice

Instructions: For the following experiments, *identify* the independent variable, dependent variable, and the control variables

1. A student wanted to test how the mass of a paper airplane affected the distance it would fly. Paper clips were added before each test flight. As each paper clip was added, the plane was tested to determine how far it would fly.

Independent variable _____

Dependent variable _____

Control variables _____

2. Two groups of students were tested to compare their speed working math problems. Each group was given the same problems. One group used calculators and the other group computed without calculators.

Independent variable _____

Dependent variable _____

Control variables _____

3. Students of different ages were given the same puzzle to assemble. The puzzle assembly time was measured.

Independent variable _____

Dependent variable _____

Control variables _____

4. An experiment was performed to determine how the amount of coffee grounds could affect the taste of coffee. The same kind of coffee, the same percolator, the same amount and type of water, the same perking time, and the same electrical sources were used.

Independent variable _____

Dependent variable _____

Hypothesis: _____

5. Sara pulled out four different CD's to find out which type helped her to finish her homework the fastest. The first CD was rock, the second reggae, the third classical, and the fourth was cumbia. She chose a math assignment that required concentration. Sara used a stopwatch with an alarm to make sure that she only listened to each CD for 5 minutes. Each time the alarm went off, Sara Lilia recorded how many problems she was able to finish.

Independent variable _____

Dependent variable _____

Hypothesis: _____