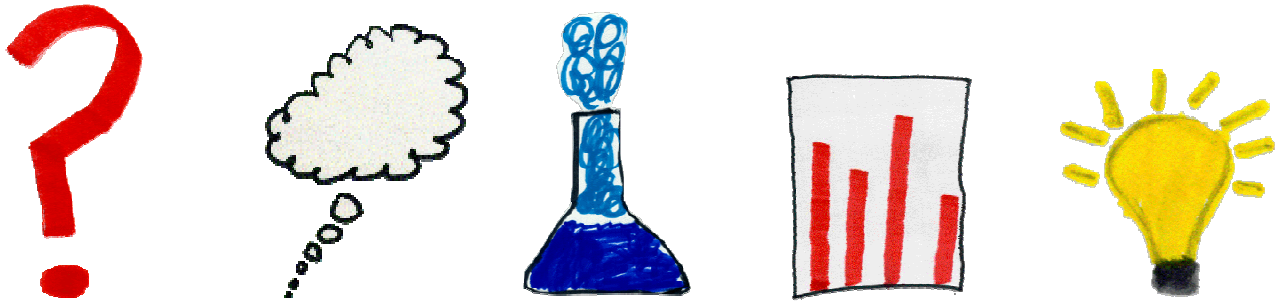
SCIENTIFIC METHOD



Problems & Questions

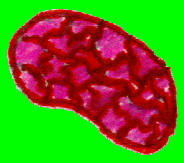
Why do we want to do experiments? We want to do experiments to find the answers to our questions or problems.

Sometimes we have questions because we're just curious. When your dog is scratching a lot and he doesn't have fleas, when flowers and grass grow in cracks in the sidewalk, or when you see insects running across the water, your curiosity may get the better of you and you start asking all kinds of questions. This may make you want to try to find those answers by doing an experiment.

People also ask questions because there are serious problems out there. Cancer, lung disease, pollution, and global warming are just a few of them. Scientists try to find medicines to cure the diseases or the sources and solutions for the other problems. The scientific method helps do this. Maybe someday YOU will find the remedies to these humongous problems.

Hypothesis

Forming a hypothesis is the second step in the Scientific Method. It is an educated guess that answers your question.



The first thing you need to have in order to form an **EDUCATED GUESS** is background knowledge. If you do not have background knowledge, then you need to hit the books to find information about your question, problem, or subject.

Researching is probably the hardest part about making a hypothesis but it's not the most important. Once you complete the research you need to decide on a hypothesis that **MAKES SENSE**. This is important because it can affect how you design your experiment, and it gives you an idea of what to be looking for during the experiment.

Designing & Doing the Experiment

STEP 1 – Consider Your Question or Problem

(What am I testing and how can I do it?)

The most important thing is to design an experiment that matches up with your question or problem. If you were testing human heart rate during exercising, you wouldn't be dealing with different brands of tennis shoes! This is a very hard step to the Scientific Method because there are so many things to look at or consider. **YOUR DESIGN SHOULD PRODUCE AN ANSWER TO YOUR QUESTION!** You might want to look back at your hypothesis for some help.

STEP 2 – Think About All the Variables

(What might change in my experiment?)

A variable is a difference or a part of your experiment that can change. For example, if you were to do an experiment on plants, some of the things that you could change include the amount of water or light, and the kind of dirt or plant. You need to list all the things that can change in your experiment. Maybe you could let a parent, teacher, or friend check over your list.

STEP 3 – Set-Up a Controlled Experiment

(How do I keep the variables from changing?)

In your experiment design you can only have one variable that changes. The variable that changes should be the one that you are testing. For example, if you chose to do an experiment on

light and plant growth, you would make sure that the variable that changes is the amount of light. If you have more than one variable that changes, that would make it an uncontrolled experiment. An uncontrolled experiment is an experiment that will not give you the answer to your question OR give you the wrong answer. Now use the list of variables that you made and make sure none of them change except the one you are testing!

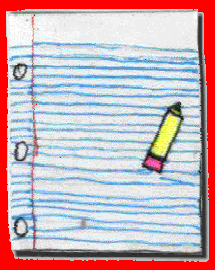
STEP 4 – Doing the Experiment

(What materials do I need?)

This is the easiest part of designing and doing an experiment because all you have to do is get your materials together and set it up! **WARNING!** You need to make sure that you're taking it seriously and thinking about safety. If your experiment is on something that could be dangerous, make sure that an adult knows what is going on.

Observing & Recording

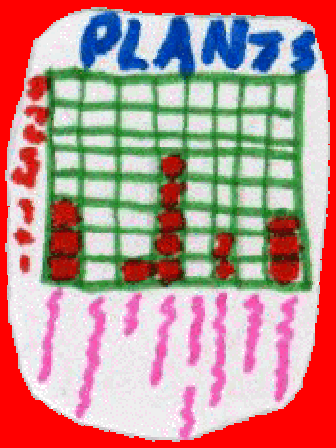
By Ravi Naik



Observing and recording is an important step in the Scientific Method. Your observations and the data you collect help you answer your question or problem and form your conclusion. It might be a good idea to have a friend help you do this step.

Qualitative Data

Observe means to examine carefully. You observe what is happening in the experiment by using your senses, but not all of them! Some of the senses are not safe to use when you're doing an experiment, such as touch and taste. What is and is not safe to use can change from experiment to experiment. This kind of data is called qualitative because you're not using any kind of instrument to collect it. You can organize your observations using things like charts or just write them down as notes.



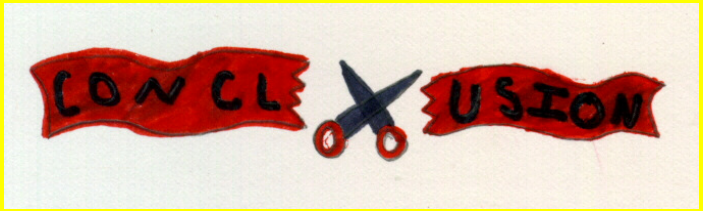
Quantitative Data

Information that you collect using instruments is called quantitative data. Quantitative data may be time, distance, length, speed, volume, mass or weight. There are all kinds of things that can be measured. You can organize your quantitative data using graphs, charts, tables or lists

Conclusion

The conclusion is important because it is the explanation and summary of what happened in the experiment. The conclusion ties everything together and answers your question or problem.

- The first thing you do in the conclusion is restate your question or problem and what you expected to happen.
- The next thing you do is explain what happened during the process of the experiment using the data and observations that were recorded in the previous step.
- The last thing you have to do is discuss the things that went right and the things that went wrong during the experiment. Sometimes you find out that you may not have designed the experiment correctly. So what did you do wrong? Maybe you used the wrong materials or had more than one variable that wasn't controlled. This means you don't get an accurate answer to your question. Other times, things just accidentally go wrong. If anything did go wrong, did it affect the way you expected the experiment to come out? All of these things need to be explained in the conclusion.



EXERCISE

Taking into account that you have understood every step of the Scientific Method, describe your own example for explaining it in the classroom. Cheer up

You can practice http://aspire.cosmic-ray.org/labs/scientific_method/sci_method_selector.swf