



Steps of the Scientific Method

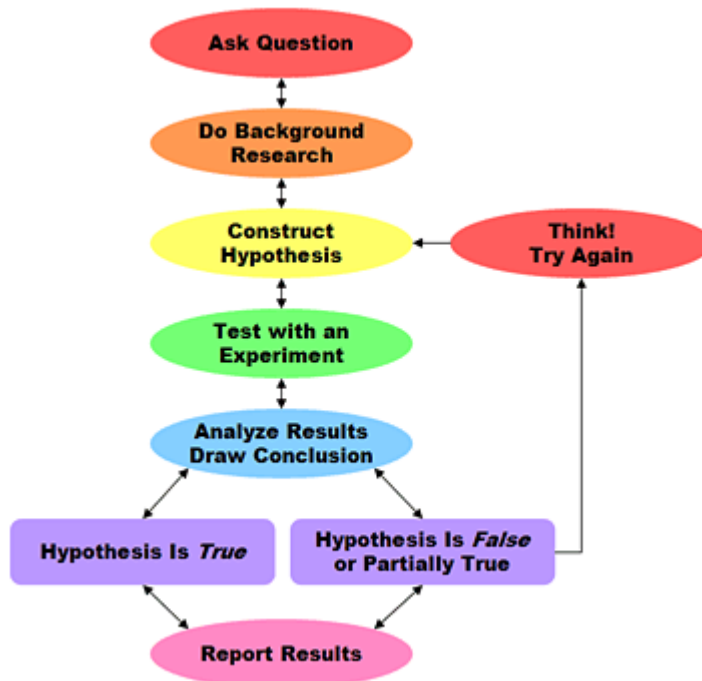
Key Info

- The scientific method is a way to ask and answer scientific questions by making observations and doing experiments.
- The steps of the scientific method are to:
 - **Ask a Question**
 - **Do Background Research**
 - **Construct a Hypothesis**
 - **Test Your Hypothesis by Doing an Experiment**
 - **Analyze Your Data and Draw a Conclusion**
 - **Communicate Your Results**
- It is important for your experiment to be a fair test. A "fair test" occurs when you change only one factor (variable) and keep all other conditions the same.

Overview of the Scientific Method

The scientific method is a process for experimentation that is used to explore observations and answer questions. Scientists use the scientific method to search for **cause and effect** relationships in nature. In other words, they design an experiment so that changes to one item cause something else to vary in a predictable way.

Just as it does for a professional scientist, the scientific method will help you to focus your science fair project question, construct a hypothesis, design, execute, and evaluate your experiment.



| Steps of the Scientific Method | Detailed Help for Each Step (More information is available on the Project Guide page of www.sciencebuddies.org .) |
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| <p>Ask a Question: The scientific method starts when you ask a question about something that you observe: How, What, When, Who, Which, Why, or Where?</p> <p>And, in order for the scientific method to answer the question it must be about something that you can measure, preferably with a number.</p> | Your Question |
| <p>Do Background Research: Rather than starting from scratch in putting together a plan for answering your question, you want to be a savvy scientist using library and Internet research to help you find the best way to do things and insure that you don't repeat mistakes from the past.</p> | Background Research Plan Finding Information Bibliography Research Paper |
| <p>Construct a Hypothesis: A hypothesis is an educated guess about how things work: "If _____ [I do this] _____, then _____ [this] _____ will happen."</p> <p>You must state your hypothesis in a way that you can easily measure, and of course, your hypothesis should be constructed in a way to help you answer your original question.</p> | Variables Variables for Beginners Hypothesis |
| <p>Test Your Hypothesis by Doing an Experiment: Your experiment tests whether your hypothesis is true or false. It is important for your experiment to be a fair test. You conduct a fair test by making sure that you change only one factor at a time while keeping all other conditions the same.</p> <p>You should also repeat your experiments several times to make sure that the first results weren't just an accident.</p> | Experimental Procedure Materials List Conducting an Experiment |
| <p>Analyze Your Data and Draw a Conclusion: Once your experiment is complete, you collect your measurements and analyze them to see if your hypothesis is true or false.</p> <p>Scientists often find that their hypothesis was false, and in such cases they will construct a new hypothesis starting the entire process of the scientific method over again. Even if they find that their hypothesis was true, they may want to test it again in a new way.</p> | Data Analysis & Graphs Conclusions |
| <p>Communicate Your Results: To complete your science fair project you will communicate your results to others in a final report and/or a display board. Professional scientists do almost exactly the same thing by publishing their final report in a scientific journal or by presenting their results on a poster at a scientific meeting.</p> | Final Report Abstract Display Board Science Fair Judging |

Even though we show the scientific method as a series of steps, keep in mind that new information or thinking might cause a scientist to back up and repeat steps at any point during the process. A process like the scientific method that involves such backing up and repeating is called an **iterative process**.

Throughout the process of doing your science fair project, you should keep a journal containing all of your important ideas and information. This journal is called a laboratory notebook.