



Steps of the Scientific Method

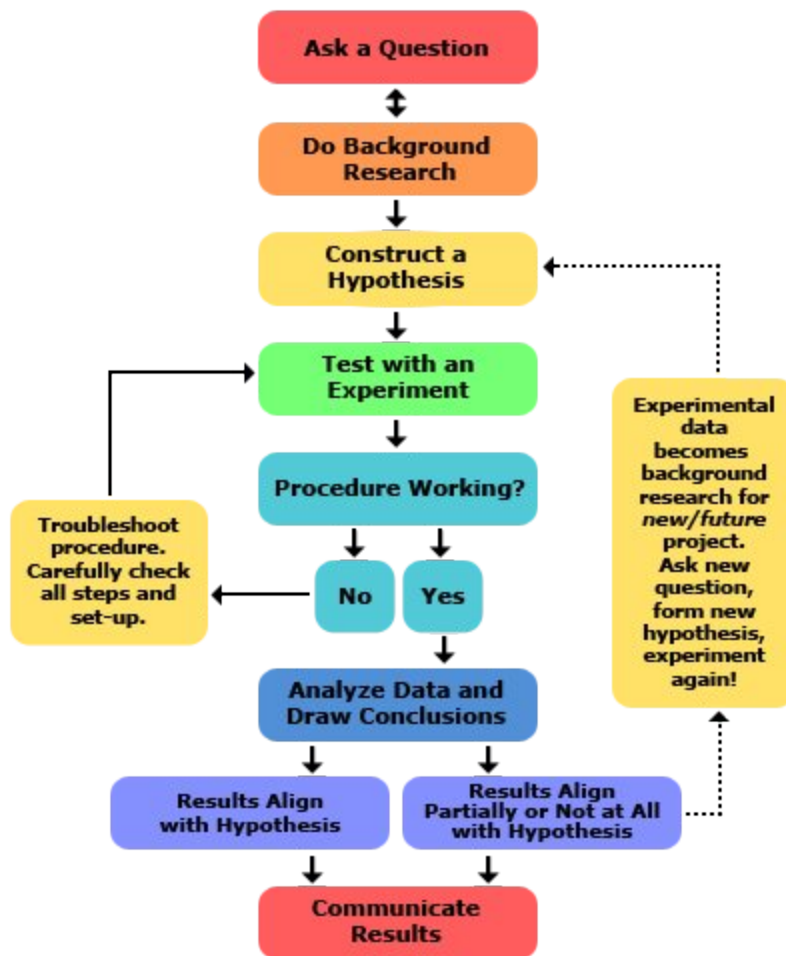
Key Info

- 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.
- While scientists study how nature works, engineers create new things, such as products, websites, environments, and experiences.
 - If your project involves creating or inventing something new, your project might better fit the steps of **The Engineering Design Process** (<http://www.sciencebuddies.org/engineering-design-process/engineering-design-process-steps.shtml>).
 - If you are not sure if your project is a scientific or engineering project, you should read **Comparing the Engineering Design Process and the Scientific Method** (<http://www.sciencebuddies.org/engineering-design-process/engineering-design-compare-scientific-method.shtml>).

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
<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>	<p>Your Question (http://www.sciencebuddies.org/science-fair-projects/project_question.shtml) </p>
<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>	<p>Background Research Plan (http://www.sciencebuddies.org/science-fair-projects/project_background_research_plan.shtml) </p> <p>Finding Information (http://www.sciencebuddies.org/science-fair-projects/project_finding_information.shtml) </p> <p>Bibliography (http://www.sciencebuddies.org/science-fair-projects/project_bibliography.shtml) </p> <p>Research Paper (http://www.sciencebuddies.org/science-fair-projects/project_research_paper.shtml) </p>
<p>Construct a Hypothesis: A hypothesis is an educated guess about how things work:</p> <p>"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>	<p>Variables (http://www.sciencebuddies.org/science-fair-projects/project_variables.shtml) </p> <p>Variables for Beginners (http://www.sciencebuddies.org/science-fair-projects/project_experiment_fair_test.shtml) </p> <p>Hypothesis (http://www.sciencebuddies.org/science-fair-projects/project_hypothesis.shtml) </p>
<p>Test Your Hypothesis by Doing an Experiment: Your experiment tests whether your hypothesis is supported or not. 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>	<p>Experimental Procedure (http://www.sciencebuddies.org/science-fair-projects/project_experimental_procedure.shtml) </p> <p>Materials List (http://www.sciencebuddies.org/science-fair-projects/project_materials_list.shtml) </p> <p>Conducting an Experiment (http://www.sciencebuddies.org/science-fair-projects/project_experiment.shtml) </p>

Steps of the Scientific Method	Detailed Help for Each Step
<p>Analyze Your Data and Draw a Conclusion: Once your experiment is complete, you collect your measurements and analyze them to see if they support your hypothesis or not.</p> <p>Scientists often find that their hypothesis was not supported, and in such cases they will construct a new hypothesis based on the information they learned during their experiment. This starts the entire process of the scientific method over again. Even if they find that their hypothesis was supported, they may want to test it again in a new way.</p>	<p>Data Analysis & Graphs (http://www.sciencebuddies.org/science-fair-projects/project_data_analysis.shtml)</p> <p>Conclusions (http://www.sciencebuddies.org/science-fair-projects/project_conclusions.shtml)</p>
<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. In a science fair, judges are interested in your findings regardless of whether or not they support your original hypothesis.</p>	<p>Final Report (http://www.sciencebuddies.org/science-fair-projects/project_final_report.shtml)</p> <p>Abstract (http://www.sciencebuddies.org/science-fair-projects/project_abstract.shtml)</p> <p>Display Board (http://www.sciencebuddies.org/science-fair-projects/project_display_board.shtml)</p> <p>Science Fair Judging (http://www.sciencebuddies.org/science-fair-projects/project_judging.shtml)</p>

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. See the Science Buddies resource [Science and Engineering Project Laboratory Notebooks](http://www.sciencebuddies.org/science-fair-projects/project_laboratory_notebook.shtml) (http://www.sciencebuddies.org/science-fair-projects/project_laboratory_notebook.shtml) for more information.

You can find this page online at: http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml



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