



Your Question

Before learning how to narrow down the question for your science fair project, it's important to have a brief introduction to the scientific method of performing an experiment.

Overview of the Scientific Method

The scientific method is a process for experimentation that is used to answer questions and explore observations.

Scientists use an experiment 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. These changing quantities are called **variables**. Variables are a key element of the scientific method.



Here is an overview of the scientific method that you will need to understand in order to complete your science fair project. Don't worry about having to learn it all at once. Every week or two, you'll have an assignment that involves just one step in this process, and at that time, we'll give you a more complete explanation, including examples and samples.

1. **Stating the Question:** What is it that you are trying to find out from your experiment? What is it that you are trying to achieve?
2. **Research Your Topic:** Investigate what others have already learned about your question. Gather information that will help you perform your experiment.
3. **State Your Hypothesis:** After having thoroughly researched a topic, you should have some prediction about what you think will happen in your experiment. This educated guess concerning the outcome is called your hypothesis. You must state your hypothesis in a way that you can readily measure.
4. **Test Your Hypothesis by Doing an Experiment:** Now that you have come up with a hypothesis, you need to develop a procedure for testing whether it is true or false. This involves changing one variable and measuring the impact that this change has on other variables. When you are conducting your experiment, you need to make sure that you are only measuring the impact of a single change.

Scientists run experiments more than once to verify that results are consistent. Each time that you perform your experiment is called a **run** or a **trial**.

5. **Analyze Your Results:** At this stage, you want to be organizing and analyzing the data that you have collected during the course of your experiment in order to summarize what your experiment has shown you.
6. **Draw Your Conclusion:** This is your opportunity to explain the meaning of your results. Did your experiment support your hypothesis? Does additional research need to be conducted? How did your experiment address your initial question and purpose?
7. **Report Your Results and Conclusion:** Since you are performing an experiment for the science fair, you will write a report and prepare a display board so that others can share in your discoveries.

The Assignment

Now that you have found a topic area that interests you, try to find some inspiration by looking through magazines, newspapers, science textbooks, TV science documentaries, science fair projects, or the Internet. Also, think about your own experiences and things that you may have observed that sparked a question in your mind.

Remember, a science fair project is all about finding an answer to a question, so make sure you select a topic that is narrow enough for you to answer with a simple experiment. Perhaps you have always had an interest in robotics and how they work. To develop a good topic for an experiment, you need to ask as specific a question as possible. For example: How much current does a robot's arm use to lift different weights?

After you have done your initial research, it's time to narrow down your topic to a single question that will be the focus of your experiment.

Then write a brief statement that summarizes what you want to accomplish.

Additional Information

If you used the Topic Selection Wizard, you saw a number of project ideas. You can refer to those same ideas and look at new ones by selecting any of the topic areas below:

- [Sample Physical Science Projects](#)
- [Sample Engineering Projects](#)
- [Sample Life Science Projects](#)
- [Sample Behavioral & Social Science Projects](#)
- [Sample Earth & Environmental Science Projects](#)
- [Sample Math & Computer Science Projects](#)

Examples

These are examples of project questions:

- Does water purity affect surface tension?
- Which material is the best insulator?
- How does arch curvature affect load carrying strength?
- How do different foundations stand up to earthquakes?
- What sugars do yeast use?
- Does fire stimulate plant growth?

Bad Topics

Some topics are best to avoid:

Topic to Avoid	Why
Any topic that boils down to a simple preference or taste comparison. For example, "Which tastes better: Coke or Pepsi?"	Such experiments don't involve the kinds of numerical measurements we want in a science fair project. They are more of a survey than an experiment.
Most consumer product testing of the "Which is best?" type. This includes comparisons of popcorn, bubblegum, make-up, detergents, cleaning products, and paper towels.	These projects only have scientific validity if the Investigator fully understands the science behind why the product works and applies that understanding to the experiment. While many consumer products are easy to use, the science behind them is often at the level of a graduate student in college.
Any topic that requires people to recall things they did in the past.	The data tends to be unreliable.
Effect of colored light on plants	Several people do this project at almost every science fair. You can be more creative!
Effect of music or talking on plants	Difficult to measure.
Effect of running, music, video games, or almost anything on blood pressure	The result is either obvious (the heart beats faster when you run) or difficult to measure with proper controls (the effect of music).
Effect of color on memory, emotion, mood, taste, strength, etc.	Highly subjective and difficult to measure.
Any topic that requires measurements that will be extremely difficult to make or repeat, given your equipment.	Without measurement, you can't do science.
Any topic that requires dangerous, hard to find, expensive, or illegal materials.	We care about your safety and your parents' pocketbook.
Graphology or handwriting analysis	Questionable scientific validity.
Astrology or ESP	No scientific validity.
Any project in violation of state law, federal law, California State Science Fair rules, or International Science & Engineering Fair rules.	In brief, you may not do a project that involves: <ul style="list-style-type: none">• Unacceptable risk (physical or psychological) to a human subject• Collection of tissue samples from living humans or vertebrate animals• Drugging, pain, or injury to a live vertebrate animal• Use of illegal or prohibited materials

Grading Yourself

Here are some things to consider as you finalize your question:

What Makes a Good Science Fair Question	For a Good Question, You Should Answer "Yes" to Every Question
Is the topic interesting enough to read about, then work on for the next couple months?	Yes / No
Can you find at least 3 sources of written information on the subject?	Yes / No
<p>Can you measure changes to the important variables using a number that represents a quantity such as a count, length, width, weight, voltage, time, etc.?</p> <p>Or, just as good, is your variable one that is simply present or not present? For example,</p> <ul style="list-style-type: none"> • Lights ON in one trial, then lights OFF in another trial, • USE fertilizer in one trial, then DON'T USE fertilizer in another trial. 	Yes / No
Can you control other factors that might influence the variables, so that they do not interfere with your experiment?	Yes / No
Is your experiment safe to perform?	Yes / No
Do you have all the materials and equipment you need for your project, or will you be able to obtain them quickly and at a very low cost?	Yes / No
Do you have enough time to do your experiment more than once before the science fair?	Yes / No
Does your project meet all the rules and requirements for your science fair?	Yes / No
Have you avoided the bad topic areas listed in the table above?	Yes / No

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