



TERRA SCIENCE AND ENGINEERING FAIRS

How do I do a Research / Engineering Design Project?

(Students *and their parents and mentors* should read this!)

Selecting a Topic

Keep it simple. What question would you like to answer? Might your family or hobbies inspire an idea? Visit [Science Buddies](#).¹ (Teachers and parents: Please don't assign a topic. Students invest more time and energy into projects inspired by their own interests.)

Ask professionals in the field. Consult your librarian. Wikipedia is NOT the source of all knowledge! (Adults: Please do NOT prepare reference lists or fact sheets!)

Purpose & Hypothesis / Engineering Goal

The *purpose* is a description of what you plan to do. The *hypothesis* for an experiment tells what you think will happen. For an engineering design or process, your *goal* is what you want your machine or process to accomplish.

Experiment / Design Iterations

Plan exactly what you will do.

For your safety, complete all of the science fair paperwork required for your grade including signatures BEFORE you begin your experiment or start your engineering design. Record EVERYTHING that does or does not happen in a bound notebook. Remember, the scientific method requires that you change only one part of the experiment at a time, and run the experiment more than once to verify the results. In an engineering project, you can change lots of things with each iteration, but you document EVERY change you make to your equipment or process, your thinking as to why you are trying this, and what happens on "the next run."

Senior Level RED: Do you want the chance to go to the Intel International Science and Engineering Fair? Check out the [Student Project Resources](#)² provided by Intel ISEF to strengthen your work, understand the [Scientific Review Committee](#)³ paperwork required for your project, and be VERY careful about recording all of your work in your lab notebook.

¹ Science Buddies URL <https://www.sciencebuddies.org/>

² Student Project Resources <https://student.societyforscience.org/science-project-resources>

³ SRC link <https://student.societyforscience.org/international-rules-pre-college-science-research?mode=blog&context=4472>

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Communicating the Results

Written Report

This can be one or many pages. Include charts, illustrations and photographs. When you are done, you should have these:

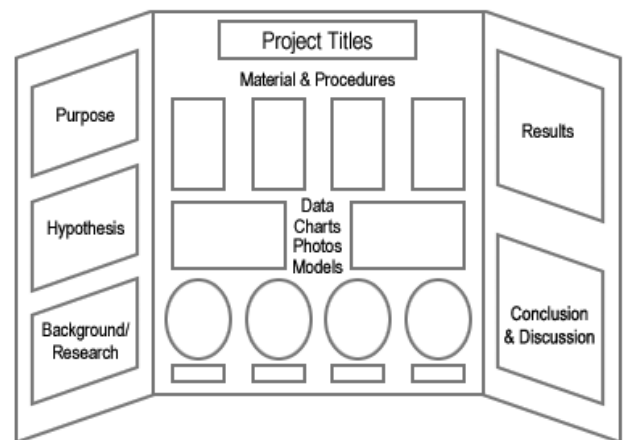
- your topic, why you chose it, and what you wanted to find out;
- how you did the experiment or design, and the information you collected;
- your conclusion based upon your results;
- a bibliography citing *every* source you used! Did you download anything from the Internet? Then include the date you downloaded AND the *complete* URL! (Reminder: "wiki.com" is NOT a complete URL.)

Exhibit and Presentation

Your exhibit lets people *see* what you did.

You need:

1. a free-standing display board - it can be bought or homemade;
2. drawings, photos, charts (anything showing your project visually), citing the source for each item, including the photographer's name for each photo. If one person took EVERY photo, you need just one label;
3. printed copies of your abstract summarizing your project at your display;
4. your written report on the table in a notebook or folder.



Your exhibit space is 48 inches wide by 30 inches deep by 72 inches high (above table top). Include on your display photos of any part of your work that cannot fit in this space. Read the Display and Safety rules to check what cannot come into an Exhibit Hall.

Bring what you need, including tape, scissors, markers, extension cords or laptops. Label *everything* with your name and your school's name. Set out your written report and at least 5-6 copies of your abstract.

We do NOT provide WiFi, nor are you to access the internet for any part of your presentation.

Now, prepare your talk (3-4 minutes). Talk briefly about how you chose your topic, your work, and your conclusions. YOUR TALK IS VERY IMPORTANT, BUT MUST BE BRIEF SO JUDGES CAN ASK QUESTIONS.

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More about Project Ideas

Still scratching your head about what to choose as your science fair project? Try this.

1. Do you want to work on your own or with a partner? The science fair does allow teams of two or three students. That will affect how you choose your project topic.
2. Then give your imagination free rein. Walk outside and see if you come across something fascinating that sparks a question in your mind. Sit quietly and see where your curiosity carries your daydreams. Next stop is the public library. Start with a topic that interests you and read along from topic to narrower topic to narrower topic until you find there's a question you've not found an answer to yet. You found your project!

More about Resources

Citizen Science

How exciting it is to be part of a “big science project” operating across your state or around the world! Do a search on “citizen science” - especially what’s available through [NASA](#)⁴, [Scientific American](#)⁵, [Cornell Ornithology Labs](#)⁶, or New York’s own [Department of Environmental Conservation](#)⁷.

Science Buddies

If time is short or you really want to jumpstart the process, Science Buddies opens a treasure chest of ideas and resources for middle and high school students starting out in the science fair process. To sections on "Getting Started" to "Abstract" and "Display Board," the team at Science Buddies adds a block of pages on Tools, Techniques, and Reference Information and Science Fair Project Additional Resources.

- [Science Buddies: Topic Selection Wizard](#)⁸
You work your way through this wizard, following your own interests until you identify a personalized cluster of projects from their library of over 800 ideas.
- [Science Buddies: Project Ideas Directory](#)⁹
Prefer to wander around a library? Then click here to browse through those 800+ ideas organized by the area of science, technology or mathematics.

⁴ *NASA Citizen Science* <https://science.nasa.gov/citizenscientists>

⁵ *Scientific American Citizen Science* <https://www.scientificamerican.com/citizen-science/>

⁶ *Cornell Ornithology Labs Citizen Science* <http://www.birds.cornell.edu/page.aspx?pid=1664>

⁷ *Department of Environmental Conservation Citizen Science* <http://www.dec.ny.gov/animals/1155.html>

⁸ *Topic Selection Wizard* sciencebuddies.org/science-fair-projects/recommender_register.php

⁹ *Project Ideas Directory* www.sciencebuddies.org/science-fair-projects/project_ideas.shtml#browseallprojects

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