

Writing the Research Paper

Why Do I Have To Do This?

Rather than starting from scratch, you want to learn from the experience of others rather than blunder around and repeat their mistakes. A scientist named Mike Kalish put it humorously like this: "A year in the lab can save you a day in the library."



Background research is also important to help you understand the theory behind your experiment. Science fair judges (and Mrs. White) like to see that you understand why your experiment turns out the way it does.

Where Do I Start?

Libraries and the Internet both contain millions of pages of information and facts. How do I find what I'm looking for?

Keywords

Of course, start with the question for your science fair project (see, we did that part first for a reason). Let's imagine that you have asked this one:

Question: Does drinking milk help decrease spiciness better than water or Pepsi?

Begin by identifying the keywords and main concepts in your question. In this case keywords would be:

Milk	Spiciness
Pepsi	Water

That's pretty easy! Now, what might be some of the main concepts that relate to these keywords? Let's think about spiciness first. You're going to do a science experiment, so knowing that a spicy food tastes "hot" is probably not sufficient. Hmmmm, this is a little tougher than finding the keywords.

The secret is to use the "question words" (why, how, who, what, when, where) with your keywords. Ask why things happen, ask how things happen, ask what causes things to happen, ask what are the properties of key substances.

Example:

- Why do spicy foods taste hot?
- How does the tongue detect spiciness?
- How does one measure spiciness?
- What are the properties or characteristics of spicy foods?
- Where in the body does the sense of spiciness occur?

Finding Information

Talk to People with More Experience

Be as specific as you can when asking your question. Instead of asking, "How do airplanes fly," try asking, "What physical forces are involved in the flight of an airplane," or "What role do propellers play in the flight of a helicopter?"

Find Print Sources

Remember, you must find at least three sources of information!

Good References	Bad References
Come from a credible source	Come from a source with poor credibility
Not too old	Out of date
Not biased	Not objective and fair, biased towards one point of view
Free of errors	Prone to errors
Properly cite the original source of all information	Do not cite where the information came from
Easy for other people to find or obtain	Difficult for others to obtain

Library Research

- Be sure to use your keywords, and don't forget to check the bibliography of any of your sources for additional sources!
- Periodicals are printed material like magazines and newspapers. You can look up your keywords in a printed index such as the Reader's Guide to Periodical Literature, which covers popular magazines.
- One little-known fact about public libraries is that they often pay for online resources that are generally inaccessible to the public. Using computers at the library, or sometimes by logging on at home with your library card number, you can gain access to information unattainable in any other way.
- In addition, branch libraries are part of a larger library system. Many libraries have loan agreements with other libraries out of county, out of state or out of country. Tell your librarian the book you want and he or she can probably obtain it for you.

Internet Research

Search engines try to index everything on the Internet. Another way to search is using a subject portal. Subject portals list just a small portion of the information on the Internet, but the sites listed have been checked for relevance. Two popular subject portals are:

- [Librarians' Index to the Internet](#)
- [WWW Virtual Library](#)

If you want some advanced tips on using the Internet to find information, here are two good sites. There is valuable information here even for people who think that they are good at Internet searching.

- <http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/FindInfo.html> A tutorial offered by the Teaching Library at the University of California at Berkeley.
- [Librarians' Index to the Internet: Internet Guide and Search Tools](#). Check out the tips in "Internet Searching."

To do an internet search for books containing information about a specific science fair project, the Science Fair Project Index (developed by the Akron Summit Public Library) is a great place to start. The Index is designed to allow the user to locate a particular experiment by the general topic; by keywords in the experiment title or book information; by grade level; by the materials or equipment employed; or by the principle demonstrated.

- <http://www.ascpl.lib.oh.us/scifair/sftp.htm>

Too Complicated or Too "Babyish" Information

Sometimes the information you find will be relevant, but either too complicated given your science background or too babyish. This is a problem that we all experience. Just keep looking and ask for advice if you're really stuck.

Bibliography

Remember, you need **AT LEAST THREE** sources!

Collect this information for each printed source:

- author name
- title of the publication (and the title of the article if it's a magazine or encyclopedia)
- date of publication
- the place of publication of a book
- the publishing company of a book
- the volume number of a magazine or printed encyclopedia
- the page number(s)

Collect this information for each Web Site:

- author and editor names (if available)
- title of the page (if available)
- the company or organization who posted the webpage
- the Web address for the page (called a URL)
- the last date you looked at the page

Basics

Your list of works cited should be on a new page with the centered title, *Works Cited*. Alphabetize the entries in your list by the author's last name. If the author's name is unknown, alphabetize by the title, ignoring any *A*, *An*, or *The*.

Format Examples

Books:

Format: Author's last name, first name. *Book title*. Additional information. City of publication: Publishing company, publication date.

- Allen, Thomas B. *Vanishing Wildlife of North America*. Washington, D.C.: National Geographic Society, 1974.
- Boorstin, Daniel J. *The Creators: A History of the Heroes of the Imagination*. New York: Random, 1992.
- Hall, Donald, ed. *The Oxford Book of American Literacy Anecdotes*. New York: Oxford UP, 1981.

Encyclopedia & Dictionary

Format: Author's last name, first name. "Title of Article." *Title of Encyclopedia*.
Date.

Note: If the dictionary or encyclopedia arranges articles alphabetically, you may omit volume and page numbers.

- "Azimuthal Equidistant Projection." *Merriam-Webster's Collegiate Dictionary*. 10th ed. 1993.
- Pettingill, Olin Sewall, Jr. "Falcon and Falconry." *World Book Encyclopedia*. 1980.

Magazine & Newspaper Articles

Format: Author's last name, first name. "Article title." *Periodical title* Volume #
Date: inclusive pages.

Note: If an edition is named on the masthead, add a comma after the date and specify the edition.

Website or Webpage

Format: Author's last name, first name (if available). "Title of work within a project or database." *Title of site, project, or database*. Editor (if available).
Electronic publication information (Date of publication or of the latest update, and name of any sponsoring institution or organization). Date of access and <full URL>.

Note: If you cannot find some of this information, cite what is available.

- Devitt, Terry. "Lightning injures four at music festival." *The Why? Files*. 2 Aug. 2001. 23 Jan. 2002 <<http://whyfiles.org/137lightning/index.html>>.
- Dove, Rita. "Lady Freedom among Us." *The Electronic Text Center*. Ed. David Seaman. 1998. Alderman Lib., U of Virginia. 19 June 1998 <<http://etext.lib.virginia.edu/subjects/afam.html>>.

- List the sources in alphabetical order using the author's last name. If a source has more than one author, alphabetize using the first one. If an author is unknown, alphabetize that source using the title instead.

Writing the Paper

The purpose of your **research paper** is to help you design an effective experiment and help you understand why your experiment turns out the way it does. The research paper should include:

- The history of similar experiments or inventions
- Definitions of all important words and concepts that describe your experiment
- Answers to all your background research plan questions

For every fact or picture in your research paper you should follow it with a citation telling the reader where you found the information. A citation is just the name of the author and the date of the publication placed in parentheses like this: (Author, date). Then remember to put this source in your bibliography!

If you copy text from one of your sources, then place it in quotation marks and follow it with a citation (Author, date). Always give credit where credit is due!

Font: 12 point Times Roman or Courier

Spacing: Double space

Rubric

Content	25 points
Grammar/spelling	10 points
<u>Title page/bibliography</u>	<u>5 points</u>

TOTAL POINTS: 40 points

NOTE: for more information on writing your project, see www.sciencebuddies.org.