Writing a Research Paper for Your Science Fair Project

Key Info

- As you do your research, follow your background research plan (http://www.sciencebuddies.org/science-fair-projects/project_background_research_plan.shtml) and take notes from your sources of information. These notes will help you write a better summary.

- The purpose of your **research paper** is to give you the information to 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
    - Mathematical formulas, if any, that you will need to describe the results of your experiment

- 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). This is called a reference citation when using APA format and parenthetical reference when using the MLA format. Its purpose is to document a source briefly, clearly, and accurately.

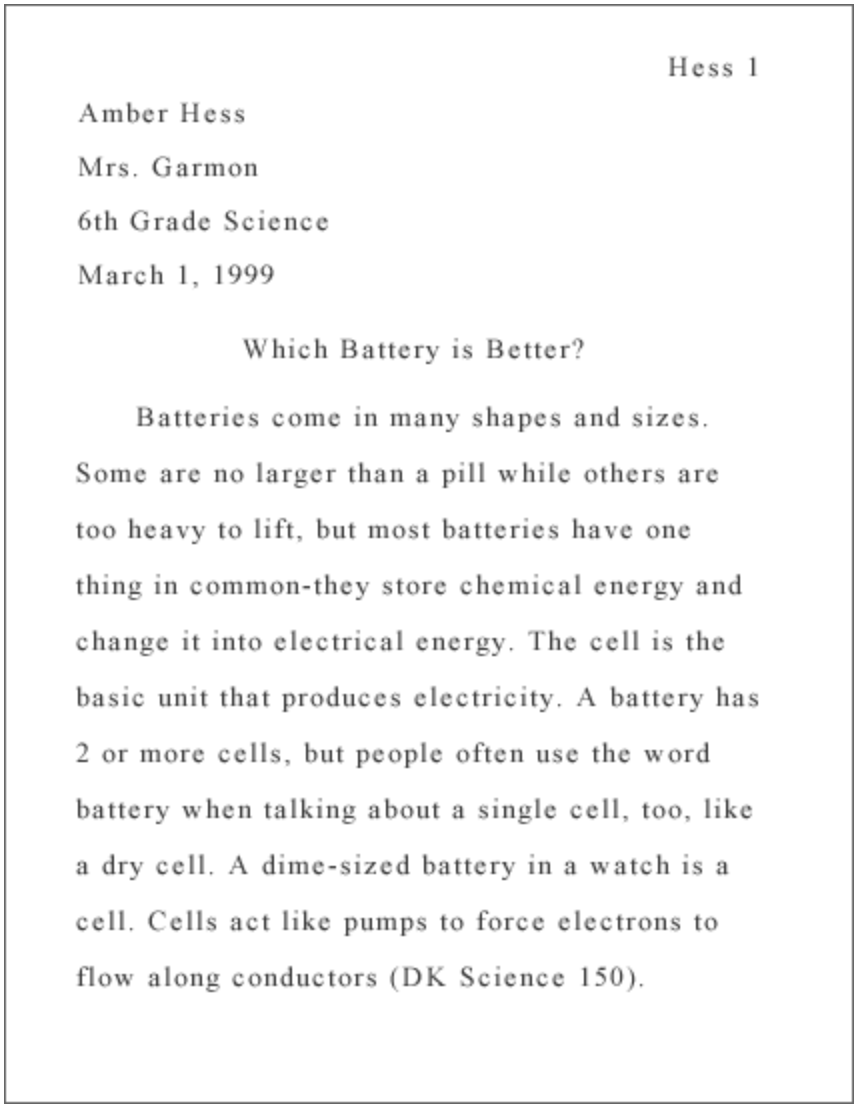
- If you copy text from one of your sources, then place it in quotation marks in addition to following it with a citation. Be sure you understand and avoid plagiarism! Do not copy another person's work and call it your own. Always give credit where credit is due!

- Most teachers want a research paper to have these sections, in order:

    - Title page (with the title of your project, your name, and the date)
    - Your report
    - Bibliography
    - Check with your teacher for additional requirements such as page numbers and a table of contents

Overview

Year after year, students find that the report called the research paper is the part of the science fair project where they learn the most. So, take it from those who preceded you, the research paper you are preparing to write is super valuable.



Hess 1

Amber Hess

Mrs. Garmon

6th Grade Science

March 1, 1999

Which Battery is Better?

Batteries come in many shapes and sizes. Some are no larger than a pill while others are too heavy to lift, but most batteries have one thing in common-they store chemical energy and change it into electrical energy. The cell is the basic unit that produces electricity. A battery has 2 or more cells, but people often use the word battery when talking about a single cell, too, like a dry cell. A dime-sized battery in a watch is a cell. Cells act like pumps to force electrons to flow along conductors (DK Science 150).

What Is a Research Paper?

The short answer is that the research paper is a report summarizing the answers to the research questions you generated in your background research plan (http://www.sciencebuddies.org/science-fair-projects/project_background_research_plan.shtml). It's a review of the relevant publications (books, magazines, websites) discussing the topic you want to investigate.

The long answer is that the research paper summarizes the theory behind your experiment. Science fair judges like to see that you understand why your experiment turns out the way it does. You do library and Internet research so that you can make a prediction of what will occur in your experiment, and then whether that prediction is right or wrong, you will have the knowledge to understand what caused the behavior you observed.

From a practical perspective, the research paper also discusses the techniques and equipment that are appropriate for investigating your topic. Some methods and techniques are more reliable because they have been used many times. Can you use a procedure for your science fair project that is similar to an experiment that has been done before? If you can obtain this information, your project will be more successful. As they say, you don't want to reinvent the wheel!

If these reasons sound to you like the reasons we gave for doing background research, you're right! The research paper is simply the "write-up" of that research.

Special Information to Include in Your Research Paper

Many science experiments can be explained using mathematics. As you write your research paper, you'll want to make sure that you include as much relevant math as you understand. If a simple equation describes aspects of your science fair project, include it.

Writing the Research Paper

Note Taking

As you read the information in your bibliography, you'll want to take notes. Some teachers recommend taking notes on note cards. Each card contains the source at the top, with key points listed or quoted underneath. Others prefer typing notes directly into a word processor. No matter how you take notes, be sure to keep track of the sources for all your key facts.

How to Organize Your Research Paper

The best way to speed your writing is to do a little planning. Before starting to write, think about the best order to discuss the major sections of your report. Generally, you will want to begin with your science fair project question so that the reader will know the purpose of your paper. What should come next? Ask yourself what information the reader needs to learn first in order to understand the rest of the paper. A typical organization might look like this:

- Your science fair project question or topic
- Definitions of all important words, concepts, and equations that describe your experiment
- The history of similar experiments
- Answers to your background research questions

When and How to Footnote or Reference Sources

When you write your research paper you might want to copy words, pictures, diagrams, or ideas from one of your sources. It is OK to copy such information as long as you reference it with a citation. If the information is a phrase, sentence, or paragraph, then you should also put it in quotation marks. A citation and quotation marks tell the reader who actually wrote the information.

For a science fair project, a reference citation (also known as author-date citation) is an accepted way to reference information you copy. Citation referencing is easy. Simply put the author's last name, the year of publication, and page number (if needed) in parentheses after the information you copy. Place the reference citation at the end of the sentence but before the final period.

Make sure that the source for every citation item copied appears in your bibliography.

Reference Citation Format

Type of Citation	Parenthetical Reference MLA Format (Author - page)	Reference Citation APA Format (Author - date)*
Work by a single author	(Bloggs 37)	(Bloggs, 2002)
Direct quote of work by single author	(Bloggs 37)	(Bloggs, 2002, p. 37)
Work by two authors	(Bloggs and Smith 37)	(Bloggs & Smith, 2002)
Work by three to five authors (first time)	(Kernis, Cornell, Sun, Berry, and Harlow 183-185)	(Kernis, Cornell, Sun, Berry, & Harlow, 1993)
Work by three to five authors (subsequent times)		(Kernis et al., 1993)
Work by six or more author	(Harris et al. 99)	(Harris et al., 2001)
Two or more works by the same author in the same year (use lower-case letters to order the entries in bibliography)		(Berndt, 1981a) (Berndt, 1981b)
Two or more works by the same author	(Berndt, Shortened First Book Title 221) then (Berndt, Shortened 2nd Book Title 68)	
Two or more works in the same parentheses	(Berndt 221; Harlow 99)	(Berndt, 2002; Harlow, 1983)
Authors with same last name	(E. Johnson 99)	(E. Johnson, 2001; L. Johnson, 1998)
Work does not have an author, cite the source by its title	(Book Title 44) or (Shortened Book Title 44)	(Book Title, 2005) or ("Article Title", 2004)
Work has unknown author and date		("Article Title", n.d.)
* APA Note: If you are directly quoting from a work, you will need to include the author, year of publication, and the page number for the reference (preceded by "p.").		

Examples of Reference Citations using APA Format

Below are examples of how reference citations would look in your paper using the APA format.

"If you copy a sentence from a book or magazine article by a single author, the reference will look like this. A comma separates the page number (or numbers) from the year" (Bloggs, 2002, p. 37).

"If you copy a sentence from a book or magazine article by more than one author, the reference will look like this" (Bloggs & Smith, 2002, p. 37).

"Sometimes the author will have two publications in your bibliography for just one year. In that case, the first publication would have an 'a' after the publication year, the second a 'b', and so on. The reference will look like this" (Nguyen, 2000b).

"When the author is unknown, the text reference for such an entry may substitute the title, or a shortened version of the title for the author" (The Chicago Manual, 1993).

"For reference citations, only direct quotes need page numbers" (Han, 1995).

"Some sources will not have dates" (Blecker, n.d.).

Credit Where Credit Is Due!

When you work hard to write something, you don't want your friends to loaf and just copy it. Every author feels the same way.

Plagiarism is when someone copies the words, pictures, diagrams, or ideas of someone else and presents them as his or her own. When you find information in a book, on the Internet, or from some other source, you MUST give the author of that information credit in a citation. If you copy a sentence or paragraph exactly, you should also use quotation marks around the text.

The surprising thing to many students is how easy it is for parents, teachers, and science fair judges to detect and prove plagiarism. So, don't go there, and don't make us try to hunt you down!

How to Format Your Research Paper

Here is information on how to format your research paper (http://www.sciencebuddies.org/science-fair-projects/project_research_paper_format.shtml).

Sample

Here is a sample research paper (http://www.sciencebuddies.org/science-fair-projects/project_sample_research_paper.pdf).

Research Paper Checklist

What Makes a Good Research Paper?	For a Good Research Paper, You Should Answer "Yes" to Every Question
Have you defined all important terms?	Yes / No
Have you clearly answered all your research questions?	Yes / No
Does your background research enable you to make a prediction of what will occur in your experiment? Will you have the knowledge to understand what causes the behavior you observe?	Yes / No
Have you included all the relevant math that you understand?	Yes / No
Have you referenced all information copied from another source and put any phrases, sentences, or paragraphs you copied in quotation marks?	Yes / No
If you are doing an engineering or programming project, have you defined your target user and answered questions about user needs, products that meet similar needs, design criteria, and important design tradeoffs?	Yes / No