

STEP 2: LITERATURE SEARCH

One of the most important aspects of the science fair project is for you to become the expert about your topic. The only way that you will be able to make informed decisions about your project is for you to do as much research as possible relating to your topic. I realize that this is not a popular step, but it is crucial to the success of the project. This background information will be the basis for the introduction to your paper. It will also help you to answer the questions that the judges will ask you at the science fair. Remember, you must be the expert in your field of study to be able to successfully discuss your project with others.

A literature search should cover all varieties of sources available to you. Sources may include, but are not limited to, books, newspapers, magazines, scientific journals, brochures, reports, tapes, videos, lectures, interviews, or the Internet. The key is to find as much information as possible. Don't set your goals low. It is better to set a goal to find 15 sources and only find 10, rather than having a goal of 3 and finding 3. Search the media center, the teacher's room, the Internet, or at home. Ask your parents or teacher for ideas. Don't waste time searching. If you can't find something ask someone for help. Materials don't magically appear. It takes a lot of hard work and MANY hours of dedicated research to develop an adequate file of information.

You will want to search for primary authoritative sources. These are sources that have original research results with the original author(s). Journals, magazines, books, and newspapers are your best choices to find original research. Secondary sources are not as good; however, they may provide some good general background information about your topic. Realize that these sources are written about the topic, but are not authoritative regarding factual results or conclusions. A good file will have a good assortment of both of these types of sources.

It is recommended that you explore beyond the Internet. Although the Internet has a vast array of information, it may be difficult to determine the validity of the site. If there is not an author or date published it is probably not a very good source. It is recommended that for every Internet site found, you should find a non-internet site. This will help to balance your sources so you have a variety of viewpoints. There are some excellent search engines that directly connect you to a journal. InfoTrac is an excellent tool to find primary authoritative sources on-line. Proquest is a good search engine for newspaper sources. MINITEX Library Information Network will provide many possible sources. Electronic Library for Minnesota (ELM) is a resource available to all citizens of Minnesota. You can access this through your local library or from home you can visit www.elm4you.org. Internet sources can be fabricated very easily. Some may even look like research, but they are fake. Check out the sample in the classroom showing data on the California Velcro Crop. Reputable cites usually end in .edu or .gov. Be careful with Internet sources!!!!

Some areas that you should be trying to locate include similar scientific studies, current and historical studies, alternative viewpoints about the problem, information about sub problems, or interviews with informed people in the field. Remember your goal is to develop a question to be solved. You need a strong background of information

to help you accomplish this goal. The library or media center can help you a lot when searching for scientific information. Don't hesitate to ask for help as you are searching.

As you search for sources, don't eliminate or try to evaluate the source for your project. You might use it after four weeks of testing. You want to keep a research file with copies of as many sources as possible. This research file will be used extensively throughout your project. A box or file system is recommended.

Once you have obtained your sources, you need to document them for future use. It is recommended that you create a bibliography source card for every source that you have found. Be sure to use a common format for bibliography cards. MLA, APA, and Chicago style are all acceptable formats. Pick one and use it consistently throughout your paper. See the following pages for examples. Keep your bibliography cards alphabetized. This will help you when you need to type your cited sources. It is suggested that you begin with a minimum of ten sources. You may add more as your project progresses. If you are using animals in your research, **YOU MUST HAVE ONE SOURCE DESCRIBING THE CARE OF THE ANIMAL.** This is an ISEF regulation. It does make sense that you should know how to care for an animal **BEFORE** you begin working with them. Your teacher has a variety of sources that will help you here. You may need to check sources in the classroom that will help you with proper formatting for these bibliographies. (Brooks, 1995; Gibaldi, 1995; Gubanich, 1985; Leahy, 1983; Pechenik, 1997; Turabian, 1987)

SAMPLE BIBLIOGRAPHIC ENTRIES

Traditional Sources

BOOK:

Author (last name first). Book Title. City of Publication: Publisher, copyright date.

Example:

McDougall, Walter. The Heavens and the Earth: A Political History of the Space Age. New York: Basic Books, 1985.

BOOK WITH 2 AUTHORS:

Example:

Kerrighan, Brian W., and Dennis M. Ritchie. The C Programming Language. Englewood Cliffs, NJ: Prentice-Hall, 1978.

BOOK WITH MANY AUTHORS:

Example:

Case, Christina et al. Microbiology. London: Benjamin Cummings Publishing Company, 1982.

PERIODICAL (MAGAZINE/NEWSPAPER):

Author (last name first). "Title of Article." Title of Periodical, Volume/Issue number (or full date of publication), page number.

Other Magazine Examples:

Weber, Bruce. "The Myth Maker." New York Times Magazine, 210(20 Oct. 1986), 23.

Camille, Andre. "Deciding Who Gets Dibs on Health-Care Dollars." Wall Street Journal, (27 March 1984), 30A and 14E.

"Rehearsal for a Space Rescue." Discover, September 1983, pp 24-27.
(NO AUTHOR GIVEN)

REFERENCE BOOKS:

"Title of Entry." Title of Reference Book. Date.

Examples:

"Voluntary Health Agencies." The Medical and Health Encyclopedia. 1987.

"Geochemistry." Webster's Seventh New Collegiate Dictionary. 1988.

INTERVIEW:

Interviewee (last name first), job title, place of work, city, state. Interviewer and date of interview. (Place of interview, if pertinent)

Example:

Morris, Franklyn B., neurologist at Mayo Clinic, Rochester, Minnesota. Interview by author, 27 Sept. 1994. St. Mary's Hospital, Rochester, Minnesota.

FILM:

Title. Director. Names of lead actors or narrator. Distributor, year. Running time if pertinent.

Example:

Much Ado About Nothing. Dir. Kenneth Branagh. With Emma Thompson, Kenneth Branagh, Denzel Washington, Michael Keaton, and Keanu Reeves. Goldwyn, 1993.

VIDEOTAPE:

Title. Videotape. Director. Narrator or actors if pertinent. Distributor. Year. Running time if pertinent.

Example:

Through the Wire. Videotape. Dir. Nina Rosenblum. Narr. Susan Sarandon. Fox/Lorber Home Video, 1990. 77 minutes.

ELECTRONIC SOURCES:

Internet Example:

Author. "Title," complete URL, date.

Yule, James. "The Cold War Revisited: A Splintered Germany," [Online]
<http://usa.coldwar.server.gov/index/cold.war/countries/former.soviet.block.html> ,
November 5, 1996.

When you have a bibliography card for each source, you will begin taking notes on each source. A note card is a record of one piece of information that you may use in writing your paper. This note card should include the source and a keyword reference. These keyword references will be used as key ideas when writing the introduction to your paper. Be sure to use a keyword on each note card and cross-reference the source so you can use this in documentation later in writing your paper. A good source for note taking is Students and Research which can be found in the classroom (Cothron, et al. 1989). Use of direct and indirect quotations will provide documentation needed in your written paper. Direct quotations are taken word for word from the source. You should include the page number with the quote, as this will be needed later when writing your paper. Indirect quotes involve taking a passage and stating it in your own words without changing the meaning of the original passage. A suggestion is that you do not use more than two consecutive words from the original passage. Be sure to use quotes on all materials that you copy from the source. **YOU MUST DOCUMENT ALL QUOTED MATERIAL.** You will have approximately 8 weeks to get notes on all of your sources. It is recommended that you begin by taking notes on books or borrowed items that need to be returned. Copied materials will always be in your file for later reference.

Some key ideas that the note cards should include are definitions, facts, previous data or studies conducted on your topic, procedural information, safety guidelines, etc. If you think you may use the information as background information in your paper it must be recorded on the note cards. These will save you a lot of time when writing your paper. A sample note card is shown below.

Author, Date	Keyword
"Direct Quotation" (page number)	
An indirect quote allows you to include information Which is not taken word for word from the text.	

Don't underestimate the importance of this step. You must be the expert if you are going to convince a judge that you are responsible for this work. Good luck in your search.

This step involves the preliminary stages of taking notes. Remember you will continue this process for many weeks. It is important that your notes are complete and organized by keywords. This will help you as you begin to write the introduction of your paper. You will save yourself A LOT of time if you take good notes.

Remember that each note card should focus only on one key idea. It is better to separate all ideas on many different cards. Be sure to include the keyword on each card. Some students have found that highlighting the keywords with a color code is very helpful in putting the same ideas together. Each card should reference the source, either by number or code (if you don't use the complete entry).

The note cards need to reflect adequate knowledge base for the complexity of your project. A general project will have many more note cards than a specific topic, which is narrowed down. It is expected that numerous hours will be needed to prepare you for understanding your project. This is not a step to take lightly. You will save many hours later if you do a good job here. As the saying goes, "you can pay me now, or you can pay me later!" Put in the time NOW!!

An alternative to notecards is to collect sources and keep a copy of each journal. Using a highlighter you can highlight the key ideas in that source. This approach saves you time initially but it will take you longer when you are assembling your paper.

The research file is a compilation of all information that you have collected through your searches. This file will probably have a number of copied sources, note card files, interview responses, notes from experts in the field, and copies of journal articles. It is important that you know everything that is available so you can relate to your topic. This file will continue to grow as you find even more information through future searches. This file will document all of the hours of searching that you have completed on your project. Once again, don't eliminate potential sources. Keep them in your file until you are 100% sure that you won't need them later in the project. The more you search, read, and understand the project, the easier it will be to explain your project to the judges.

Assignment 6: OUTLINE FOR PAPER

Now that you have a good foundation for your project, we need to turn our attention to the early stages of writing a scientific paper. The first section of the paper is the introduction, which summarizes the key background ideas that you have been collecting in your literature search. The author finds it very helpful to establish an outline for writing your paper. You have been accumulating note cards using different keywords. You should be able to take these keywords and organize your paper in the order that you wish to write your introduction. You will want to look at each keyword to identify how

you may subdivide the keyword into smaller groups. A sample outline is shown below. Note that you always find two subdivisions below each heading. If you only have one subdivision, then it should be included in the heading. It is recommended that the introduction include a purpose statement and the last paragraph of the introduction focus on the hypothesis of your study.

As you plan your outline, plan so that the ideas flow from one into another. Avoid jumping from topic to topic and then back to the original topic. Keep your ideas together by subject or keywords and you should have no problem. Remember that you will end with the hypothesis for your project. Build up to this with the most important aspect of your background being discussed before the purpose statement and hypothesis.

SAMPLE OUTLINE

- I. Main Heading 1
 - A. Subheading 1
 - B. Subheading 2
 - C. Subheading 3

- II. Main Heading 2
 - A. Subheading 1
 - 1. Idea 1
 - 2. Idea 2
 - B. Subheading 2
 - 1. Idea 1
 - a. example 1
 - b. example 2
 - c. example 3
 - 2. Idea 2

- III. Main Heading 3
- IV. Purpose Statement
- V. Hypothesis

ASSIGNMENT 6

1. Create an outline using all keyword ideas for your project.

Assignment 7: INTRODUCTION

The introduction is a very important part of your final paper. It provides an adequate review of the literature and it defines key facts and ideas that are central to solving your problem. The introduction is typically one to four pages in length depending on the complexity of your project. Remember the total length of the written paper, including graphs and tables, should not exceed twenty pages. A historical review and any previous studies relating to your problem should be documented in the introduction.

The introduction tells your readers about the topic by briefly describing what you intend to do and what others have already done. Describe any facts that helped you formulate your hypothesis. You must give a clear picture of the work already done in the area you are studying. Be sure to read about the work of other scientists. Avoid the temptation to include all facts that you read about during your note taking experience. You may have discovered many interesting facts during your literature search, but only include material that is important to your project.

It is recommended that you end the introduction with your hypothesis. Some suggestions for your introduction include:

1. Begin with an opening sentence that gets the readers attention.
Avoid starting your introduction with “My project is about . . .”
2. Define key background terms used in your study. These are probably your keywords from your note cards.
3. Organize your paragraphs by keywords from your research.
4. Include related studies.
5. DOCUMENT all borrowed information by quoting, by giving reference to the source, or by citing the source.
6. End your introduction with the hypothesis of your study.
7. Avoid using First Person writing style. Don’t use personal pronouns such as I, we, and they unless absolutely necessary.
8. Write the introduction as if it could be published and written by anyone.

When referring to examples, remember each one has good and bad parts. These are not necessarily perfect examples to follow word for word. You will also find some common problems with introductions based on the article entitled, Guidelines for Preparation and Presentation of Student Research (Martin and Brenstein, 1998). You may also find the guidelines from the Minnesota Academy of Science to be very useful. These are located in the classroom.

What is the purpose for doing this work? If it is simply to get a grade for school, stop now. Get out. You’re doing this for the wrong reason. Remember, you should be trying to impress yourself with solving a problem. Don’t try to impress your teacher or the judge with your brilliant intelligence. Show a genuine look at a unique problem that you are attempting to solve.

Why is this research important to the world? Why is it important to you? How does this problem fit into everyday living? These are some of the questions that your purpose statement should address. Your purpose should address an ethical project showing a reason that this work is important. It is important to show how this project applies to your life. Refer back to assignment 1 which addresses these ideas.

The purpose statement should be clear and concise. Get to the point. Don’t put a lot of fluff in the purpose statement. A good purpose statement should be three to six sentences in length. Give some explanation but keep it brief. Keep all explanations in the body of the introduction section.

ASSIGNMENT 7

1. To develop a sound theoretical/methodological framework for your project.
2. To adequately review the literature available to you regarding your project.
3. To develop a clear purpose statement and hypothesis for use in the paper and on the display board.

ASSIGNMENT 8

1. Revise assignment 7

Assignment 9: BIBLIOGRAPHY

The bibliography is a record of all sources that were cited somewhere in the paper. Most of these will be from the literature search, however some may be procedural or from the discussion section. The bibliography of cited sources will change throughout the process of writing your paper. If you have kept accurate bibliography cards you should be able to copy the entry from the cards.

This is one section that you definitely want to save on your computer and a storage device. It is very important to have a backup. It is tedious to get everything formatted so you don't want to type this part more than one time. If you need to add a source it will be easy to insert as necessary.

You will want to follow the format from the beginning of this step. Remember to alphabetize your sources. Typically the author's last name is first. You can find samples in the back of this book on the CD provided. You may also find samples in the classroom or you can find other examples in writing books (Brooks, 1995; Gibaldi, 1995; Gubanich, 1985; Leahy, 1983; Pechenik, 1997; Turabian, 1987). Ask your teacher, parent, or librarian for help if you are having trouble with formatting. You may also use many different bibliography generators from the internet. We typically use MLA format, although other formats are also acceptable. Refer to the ISEF Student Manual for other formats.

The following guidelines should be followed when word processing a bibliography:

1. single space your bibliography
2. do not number your entries in the bibliography
3. alphabetize your bibliography by author; if there is no author use the title for alphabetizing
4. the author's last name always goes first
5. first line of bibliography is not indented; the second line is indented
6. double space between entries
7. pay attention to punctuation within each entry; be consistent using same style throughout bibliography
8. remember to end each entry with a period
9. underline book, encyclopedia, magazine, and journal titles

10. use quotes around the titles of articles from encyclopedia or journals
(Martin and Brenstein, 1998)

ASSIGNMENT 9

To develop a bibliography of cited sources used in the body of the paper.

STEP 2 GRADE CRITERIA

E=Excellent

S=Satisfactory

N=Needs Work

The following grade criteria will be used to assign points for this assignment:

- _____ Background sources are authoritative primary and secondary
- _____ Research File shows adequate background information
- _____ Outline shows logical flow and uses proper format
- _____ Introduction explains the relevance of information to your project
- _____ The writing is clear and easy to understand
- _____ Technical vocabulary is used correctly
- _____ Documentation of Sources used
- _____ Bibliography in proper format
- _____ Minimum of five sources required in Introduction

Format (Grammar, Spelling, Typed, Style) _____

Content (Information, Documented, Reliable, Journal) _____

Creativity/Originality (Ownership of Project, Ingenuity) _____

EXCELLENT WORK: 28-30

SATISFACTORY WORK: 24-27

NEEDS IMPROVEMENT: 21-23

Total Points _____/30 points

Suggestions for Improvement: