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ABSTRACT

This writing manual, designed for use in the Contemporary Issues in Science Program (CIIS), provides hints, recommendations, and techniques for writing papers, using reference works. Procedures and activities are presented to help students choose a topic, limit the topic, start a preliminary bibliography, locate references, gather notes, and use footnotes to document sources. Additional activities and information are provided related to writing style, revision and proofreading, and paper format. (JN)

WRITING MANUAL

CIIS

CONTEMPORARY ISSUES IN SCIENCE

CONTEMPORARY ISSUES IN SCIENCE

Writing Manual

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Anyone wishing to contribute comments or suggestions on the contents of this *Writing Manual* is encouraged to write to: Contemporary Issues in Science, c/o Staten Island Continuum of Education, Inc., 130 Stuyvesant Place, Room 704, Staten Island, New York 10301.

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Contemporary Issues in Science

Writing Manual

Introduction

In writing research papers it is important that certain standard procedures be followed. Unfortunately, the preparation of many student research papers resembles a cooking recipe for pizza in that everyone seems to have a different approach. This manual, it is hoped, will provide uniformity and consistency in the preparation of student manuscripts. It will provide students with hints, recommendations, and techniques for writing papers, using reference works. Following the procedures presented here, you will be able to:

1. choose a topic
2. limit the topic
3. start a preliminary bibliography
4. formulate preliminary outlines
5. locate references
6. gather notes
7. use footnotes to document your sources

How To Research

How do I select a topic?

Why is it important to have a limited topic?

Before you start you need not have knowledge of the area you plan to research, but you should have interest in it. However, your subject must be something you are able to do.

Choose a topic that interests you and about which you want to learn more. Do not select a topic if you hate the thought of studying it.

Some topics are broad enough to have books written about them as indeed they have been. Remember, however, you are writing a research paper, not a book. Limit your subject so that you will be able to handle it and do it justice. Narrow the focus of your approach. For example instead of writing on "Solar Energy", you might do research on "The Implications of Solar Energy on the Housing Industry in Denver." "The Effects of Acid Rain on Vegetation" is a much more focused topic than "Acid Rain."

Activity No. 1

Practice limiting topics. Narrow the following broad topics and list possible sub-topics for each which you could look up for additional information.

Euthanasia
Sterilization
Health Hazards
Scientific Ethics
Space Technology

Preliminary Search

Where do I start?
What is a bibliography?
Why do I need index cards?
What will I find in the card catalogue?

Research is like diving into a pool of cold water. You can talk about it all you want, but you won't know what it is like until you take that long step and dive. How you'll land and how deep you will go; you will find out only after you take the plunge and start.

Many people begin by reading general articles on their chosen subject in encyclopedias or journals. This will give you a start. Often after the article you will find a short bibliography that will list major authors and their works in this field. A bibliography is a list of sources of information—such as books, magazines, journals, pamphlets, articles, etc.

Once you have selected a limited topic, start preparing your own bibliography from the sources you have read and from promising titles in the card catalogue. Use works that have been published within the past four years.

The card catalogue is the index to the whole library. It lists all books and all bound magazines that are in a particular library. Sometimes in a small library the card catalogue consists of only a few drawers with alphabetically arranged cards. In other cases, however, the card catalogue can envelope an entire room with alphabetical lists of the works housed in that library.

There are usually three cards for each book found in a library—an "author" card; a "title" card; and a "subject" card. Thus, in most libraries each book is alphabetically listed on the card catalogue once according to its author, again according to its title, and yet again according to its topic or subject.

The New York Public Library came out in 1981 with a new system called the *Book Catalog* which provides data on adult materials catalogued for its branches since November 1972. This *Book Catalog* is divided into three parts—NAMES—TITLES—SUBJECTS—which follow the old card catalogue system. Each part is composed of a number of alphabetically arranged volumes. Monthly cumulative supplements show materials added to branch libraries, and the basic volumes are reissued periodically. As always, if you have difficulty finding something, consult the librarian.

Activity No. 2

1. Using the card catalogue in your local library, list five works that may be of use to you for any *one* of the topics listed in Activity No. 1.
2. Study the following card from a college library.
   a. Is this a subject, title, or author card?
   b. What is the title of the work?
   c. Who is the author?
   d. When was it published?
   e. Who published the work?
   f. How many pages does it contain?
   g. Why is the date of publication important?

GENETIC ENGINEERING—SOCIAL ASPECTS

QH
442

Goodfield, G. June.
Playing God: genetic enginnering and the manipulation of Life / June Goodfield. -- 1st ed. -- New York: Random House, C1977
xiii, 219 p. ; 22 cm.
ISBN 0-394-40692-8

1. Genetic engineering—Social aspects. 1. Title

AH442.G66

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77-6023

NRIC

B/NA A D7-002316 PLAYINGG 05/15/78

Preliminary Bibliography

As you begin your search for information, write down the most promising titles you find. Use 3x5 index cards because they are easy to handle and can be rearranged very easily. This is your preliminary bibliography. It is a tentative list. Later you may drop from this list books and articles that prove of little value. You will also, in all probability, add useful references to this list as you come across them. Your final bibliography will include all those works that helped in writing your paper.

Make out a separate 3x5 index card for each source you consult. Keep it accurate and it will make things much easier for you later.

BOOK

For every book you use, make out a card with the author's last name, or initial; *title of the work* underlined; place of publication; publisher; and date of publication.

> Bamer, John
>
> *Pollution Control: Costs and Benefits*
>
> Washington, D.C.: Editorial Research Reports, 1976

Note: When you have two or three authors, indicate the second and/or third author's names. With more than three authors, use "et al," which means "and others," after the first author.

ARTICLE

For each article, make out a card indicating: author's last name, first name or initials; "title of article" in quotation marks; *name of periodical* underlined; complete date of the issue and/or volume; page(s) cited.

> Barber, B.
>
> "The Ethics of Experimentation with Human Subjects"
>
> *Scientific American*
>
> 1976 Vol. 234
>
> pages 25-31

Outlining

Why do I need an outline?
Do I have to stick to it?
Do I take notes before or after I write my outline?

Now that you have enough information to think you know where you are going, it is time to plan how to get there. After your preliminary readings, you will be able to develop a tentative outline for your research paper. This tentative outline will enable you to discard irrelevant material and to begin spotting valuable passages on which you will want to take notes. Taking notes without knowing what you are looking for is pure frustation and a wasted effort.

Gary Rumain, a student at Susan E. Wagner High School, participated in a Science Forum. His initial outline might have looked something like this:

Human Experimentation

I. Introduction
II. Physical Experimentation
III. Psychological Experimentation
IV. Chemical Experimentation
V. Analysis
VI. Impact

With a rough and incomplete outline such as this as a guide, you would be ready to begin meaningful note-taking. As you read, indeed, you might see the need to change your first outline. Gary, for example, might choose to drop Chemical Experimentation from his outline since it is basically the same as physical and psychological experimentation because chemicals can do damage physically as carcinogens or psychologically as hallucinogens. On the other hand, however, he might decide to add another element to his outline.

At this point, the outline is still flexible. It is helpful now to make a precise statement of the central or controlling idea of your paper. This thesis will later be expanded into what is called an *abstract*. In Gary's case, he might have summed up his main idea with the following thesis: "The various risks of different types of experimentations carry a need for precautions to protect the subjects of these experimentations as well as society as a whole."

His second outline might be modified now to look like this:

Human Experimentation
Risk/Benefit Assessment

Thesis: The various risks of different types of experimentations carry a need for precautions to protect the subjects of these experiments as well as society as a whole.

I. Introduction
   A. Definition of Risk/Benefit Assessment

II. Physical Experimentation
   A. Tuskegee Case
   B. Willowbrook Experiment

III. Psychological Experimentation
   A. Zimbardo Prison
   B. Milgram Experiment

IV. Genetic Experimentation
   A. Recombinant DNA Experiments
   B. Pox Virus Accident

V. Analysis (Conclusions)

VI. Impact (Recommendations)

Activity No. 3

1. A. Gather general information on a topic through reading encyclopedia articles, chapters in textbooks, or assigned readings.

   B. Develop a thesis (the central or controlling idea of the research paper). The thesis is a statement to be proved or maintained against objections.

2. Read the following passage, rearrange the sentences and then answer the questions below.

   My uncle smokes incessantly and won't give it up. Cigarettes cost much more than they used to. He has asthma. He spends a lot on smoking. He coughs all the time. Sometimes he smokes at night, lying in bed. He complains about shortness of breath. Once he fell asleep with a cigarette still lit. He is tired all the time. His young children say they want to start smoking. Manufacturing cigarettes uses power, labor, and farmland which could be used for other purposes. The pillow began to smolder. His children want to do the things he does. He woke up because he smelled the smoke and he put the fire out.

This paragraph gives several reasons why the writer's uncle should stop smoking.

A. Are the reasons in logical order?

B. Do all these reasons belong in the same paragraph?

C. How can they be arranged so they are more convincing?

D. What is the best way to arrange ideas so that they are most effective in getting a reader to agree with them?

Locating References

Where do I find the facts for my paper?
What is the difference between primary and secondary sources?
How do I locate articles in periodicals?
How do I locate newspaper articles?
What other sources are available to help locate articles?

The card catalogue has already been listed as a source for locating books on your subjects. In certain areas, however, such as science, events happen so quickly that many books in a library do not contain the most recent findings or developments. In this case, periodicals, such as magazines or journals, which are published more frequently (weekly, biweekly, monthly, or quarterly) or newspapers can supply you with valuable current information.

In your research paper you should be giving an unbiased analysis. To do this you will need information from various sources. Primary sources are the original sources. These would include articles written by the people who participate in the work discussed and write from first hand knowledge. For example, a scientist who studied the biological reaction of rats and humans to a synthetic hormone might report his findings in a periodical such as *The Journal of Toxicology and Environmental Health*. This would be a primary source. On the other hand, suppose these findings made the news and were reported in the science section of *Newsweek* and/or *Time*. In this case, the source would be a secondary source since someone *else* was telling about the original or primary study.

WARNING: As an objective analyst, you should be cautious of secondary sources. They can be important and helpful since they may point out areas in the original study that are open to question, or they may emphasize a point you may have missed. However, secondary sources can be clearly biased depending on the personal prejudices of the writer or the editorial leanings of the periodical. As you investigate, this should become evident. Read with a critical awareness, always keeping these facts in mind.

Periodicals:

But how do you find that article on synthetic hormones? Where and when was it published? *The Readers' Guide to Periodical Literature* (1900-present) would be a good place to look for an article of a general nature. *The Readers' Guide* is issued monthly and semi-monthly and lists American articles alphabetically by author and subject. It also comes out in one year indexes and cumulative indexes every three or four years.

If you are looking for information on a given subject, such as hormones, you would look up that subject and find a list of articles, complete with the titles, authors, names of magazines, and dates of magazines on that subject for the time period covered by that issue of *The Readers' Guide*. The librarian will help you get the magazine and then you can check whether or not the article will be of use to you. Remember, however, *The Readers' Guide* indexes over 120 general magazines. If your library does not have the magazine you want, the librarian may suggest another library that might be of help.

Newspapers:

A most useful reference tool for the research writer who wants current news is the newspaper. Fortunately, the *New York Times* publishes an index which is excellent for locating major news events from sports to science and from government to the humanities.

Issued bi-weekly and monthly during the year, *The New York Times Index* is published in a bound, cumulative edition annually. It is arranged alphabetically by subject and covers the periods from 1894 to 1904 and 1913 to the present. It lists the date, page, and column number of newspaper articles. The librarian will help you locate the articles you wish by giving you microfilm for the date you want and showing you how to use the microfilm machine. This can be an experience well worth the time and effort.

Other Services Available:

There are a number of specialized reference materials also available to the research student who knows where to look. For example, *Biological Abstracts* is issued twice monthly and consists of abstracts and indexes to biological research literature. Abstracts of more than 140,000 research papers, arranged for publication under 623 subject categories, are included annually. These are derived from approximately 7600 journals from some 100 countries throughout the world. Each issues of *Biological Abstracts* contains about 6000 abstracts or summaries arranged according to alphabetical subject categories and accompanied by full bibliographic citations.

Biology Digest, another excellent source, is designed specifically for high school students. It is published in nine monthly issues. This periodical is useful because it summarizes, organizes and indexes the most recent worldwide scientific developments and research in the life sciences.

If available, *Current Contents* is another very valuable research tool. It lists the titles and authors of all recent publications in a particular field. Issued weekly, it contains a subject index. It also lists mailing addresses of the various authors.

Other useful research tools include *Scientific American, Science* and *Science 80, 81 and 82*. Consult the *Readers' Guide* and the journals' annual indexes.

Direct Contact:

A source students frequently overlook is writing to individuals in the field about which they are researching. Many authors of articles and many organizations are more than willing to send published reports, reprints of articles, personal comments, and printed literature. If you choose to write, do so immediately. Often there will be a substantial delay between your letter and the response.

To locate addresses and groups within your topic area, read through your preliminary bibliography. Write to the author in care of the publisher for additional information. You may also wish to write organizations mentioned in articles. The librarian might be able to check *Current Contents* for addresses of authors and help you with the addresses. Tell whomever you are writing to who you are and why you are requesting this information. Be sure to always include a self-addressed stamped envelope. You might also consider contacting the author by telephone. Be prepared with questions to ask and take careful notes.

Activity No. 4

Imagine you are writing a science research paper on the ethics of government experimentation in the use of drugs. You have just read an informative article in the February 1979 issue of *The Hastings Center Report*. The article was written by Glenn C. Graber and Frank H. Marsh entitled "Ought a Defendant Be Drugged to Stand Trial?"

Write a business letter to Glenn C. Graber, Ph.D., in care of *The Hastings Center Report*, 360 Broadway, Hastings-on-Hudson, N.Y. 10706, requesting further information on this topic.

In your letter be sure to:

a. Explain your situation.

b. Explain exactly what help you wish from Dr. Graber.

c. Give complete and correct information.

d. Use an acceptable business letter form.

e Mention that you are enclosing a self-addressed, stamped envelope.

f. Be clear, concise, and courteous.

Abstracting and Cataloguing References

How do I read technical literature?

Where do I put my notes

How can I organize them easily?

Why should I list the page number for information with my notes?

Is it better to copy directly from a source or to summarize in my own words?

How much quoted material should be in my paper?

Now you should know where to look (preliminary bibliography on 3x5 index cards) and what to be looking for (preliminary outline). You will have to go to many books and articles to find the information you need. Realistically, you cannot take the time to read each book and article from cover to cover. You will use tables of contents and indexes as well as skills of skimming and scanning to find what you want. In the course of your research, you will find some articles which will be of no use to you and which will be eliminated from your bibliography. It is from the useful books, periodicals, and other sources that your paper will be written, and it is from these sources that you will have to take notes.

Reading technical literature requires special skills. Reading is often like driving a stick shift car. For different situations, you must shift gears. A mystery novel does not require the same degree of difficulty as a scientific journal, any more than driving down a steep hill requires the same energy as driving up that same incline.

In reading a scientific journal, for example, you must adjust your reading speed and know where to look. Frequently, the article will begin with an abstract or summary of what the study concerns and what conclusions and recommendations have been made. Skim through the article. Do not read every word. Indeed, excess verbiage in government documents and publications has caused the U.S. Government to institute a new policy to put ideas in more precise, clear everyday language.

Look for heading and subheadings. Scan for the information. Some of what is written will not apply to your topic. In technical journals, the last few paragraphs of an article generally sum up and emphasize major points and/or make specific recommendations. Use these recommendations to aid in your note taking.

Activity No. 5

A cure has been found for cellulite. According to British sources, cellulite, the fatty material that deposits itself on the thighs and buttocks of females, may now be dramatically reduced through the use of a miracle fluid and 18 hypodermic needles. The needles are placed in a circular machine called a "hedgehog", which resembles an English animal, like our porcupine, that carries quills on its body.

The new procedure which was first developed in France where it was widely acclaimed involves filling the needles with a special fat-dispensing fluid. The liquid is then injected into the problem spots and the fatty lumps soon disappear like magic.

The "hedgehog" therapy, as it is called, is claimed to be the best remedy for cellulite because the lumpy fat tends to "settle" on the female body and cannot be removed by traditional diets or exercise.

a. What is the best title for this passage? Look for the topic sentence. How does "Cellulite" compare with "A possible remedy for cellulite"?

b. How was the passage organized? (Chronological, inductive, deductive, cause and effect?)

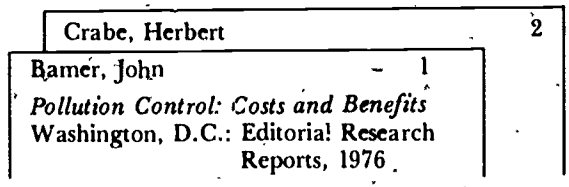
c. Write sample notes you would extract from this passage.

d. What evidence can you give that this source is impartial, objective, subjective or biased?

One easy and reliable method to take notes is to use 4x6 index cards. The larger cards give you more room to write. The key to remember in *whatever* system you select is to be organized from the start and the writing of your paper will be simplified later.

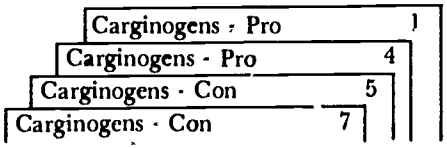
If you choose the index card system, first put your preliminary bibliography cards in alphabetical order and number them consecutively in the upper right corner.

For example:



You may add articles and books to your bibliography later. Remember, to assign each work a separate number.

Now you are ready to start taking notes. Each 4x6 card should be given a heading corresponding to your preliminary outline. Make sure you key the cards to significant words or ideas in your outline. In the upper left corner of the card, write the idea the notes are about. Note that each card should have notes from *only one source* about *only one idea*.



The number in the right corner of the cards above indicates that all four cards contain notes from different sources. The words at the left indicate that two of them contain notes on the argument for (pro) carcinogens while two contain notes on the arguments against (con) carcinogens. When your research is completed you can organize your notes according to headings which will correspond to your outline.

Remember *each* card will contain a *single* note on a *single* heading from a *single* work.

Take notes in your own words. Paraphrase, summarize, abbreviate, condense. Interpret what you read and describe it yourself. These ideas must be footnoted if you use them. Very seldom should you write a note that is a direct quotation from the source you are reading. Use the exact words and phrases from your source only when they are especially effective, important, or worthwhile. Your paper should contain *no more than five percent quoted material*. When you do quote directly, make sure you quote verbatim—exactly as it is written—and enclose it in quotation marks.

At the bottom of each note card make sure you indicate the page or pages from which you have obtained your information. This will be most helpful when you are footnoting your finished paper.

The following examples illustrate possible student note taking cards. Read them carefully. What does the number in the upper right signify? Where is the page number? What differences do you see between the cards?

A.

Nitrite Risks 14

Greatest risks might come from presence of nitrosable drugs or chemicals in abs. of food or other blocking agents.

p. 8

B.

Saccharin Risks 9

O.T.A. test results find: "Presumptive evidence of risk to humans."

p. 41

Sample A's note card is written in the student's own words and summarizes a point from an article. Note certain words have been omitted. The student's bibliography would reveal #14 refers to an article by S.R. Tannenbaum called "Ins and Outs of Nitrates" found in *The Sciences*, Vol. 20, on, as the card indicates, page 8.

Sample B, on the other hand, is an example of a quotation the student researcher found so important for her paper she quoted the exact words. Note the use of direct quotation marks. The student's bibliography would indicate that #9 refers to T.A. Maugh's "Chemical Carcinogens: How Dangerous Are Low Doses?" in *Science*, Vol. 202, on page 41.

Activity No. 6

Comprehension is an essential part of note taking. Read the following excerpt from *Science*, Vol. 201, 18 August 1978 on "Gene Splicers." After you have read it, write a sample note you might take from it. Make your writing crisp, clearcut, and accurate. Avoid stiff, verbose, over-inflated language.

> "Many gene splicing experiments consist of splicing DNA from the organism of interest onto a virus or plasmid which can replicate in the human gut bacterium *Escherichia* coil. The inserted DNA is, as it were, xeroxed each time the bacterium divides, a process known as cloning. A major reason for drawing up safety rules was the suggestion that the bacteria might in some circumstances gain pathogenic features from the foreign DNA sequences being cloned in them...."

Citing References

Why do I need footnotes?

What is the difference between a footnote and a bibliography?

How do I write a footnote?

Should footnotes be numbered?

How many footnotes do I need in a research paper?

What is plagiarism?

What does *Ibid.* mean?

Following your outline you will gather a large quantity of data on your subject. Your notes should cover every aspect of your outline. A major part of your research paper will necessarily be data obtained from your reading. You may notice that one or more sections of your outline may change. This is perfectly all right. Your preliminary outline is intentionally flexible to allow for such changes.

As you collect materials and information, you should be critically thinking about using this data for your later conclusions and recommendations. The research paper should reflect your thinking as well as the thinking of others.

Since most of the body of your paper will deal with information collected in the work of others, you should give them proper credit. The way in which you do this is to use footnotes.

The footnote is similar to the bibliography, but not the same. The bibliography gives the reader a list of all the sources you have referred to in your paper. The bibliography, however, is arranged alphabetically and does not refer in any way to the order in which your sources were used. It is the job of the footnote to tell the reader *exactly* where you got a particular piece of information used in your paper. The footnote tells the reader precisely where you found the facts you are using, who wrote them, when they were published, and the exact page or pages where you found them.

In orde. to signal the reader that you are using another's data or opinions, a number is placed after what has been borrowed. A standardized procedure is used to write each footnote.

Read the following excerpt from a student's paper. Note the position of the number indicated on the footnote and the form of the footnote itself.

> A single harmless blood test has been developed which can tell months before the birth of a baby whether the child will be the victim of a birth defect.[1] This advance in science, however, has opened up a large area of debate.

---

1 John Chedd, "Who Should Be Born?" *Science*, 175 (24 March 1982), p. 33.

The footnote tells the reader the source of your facts and where he or she could check the information stated and/or read the entire piece. Note the page number is included. This is most important for without the page number there would be no way to verify your data.

Footnotes should be numbered consecutively throughout your paper. Some people prefer to list footnotes at the bottom of their page while other place a separate page of footnotes at the end of the paper.

Some of the material in your paper will be based on your own generalizations and observations. The purpose of footnotes is to give proper credit to your sources. To do this, every quotation must have footnotes and so must all the facts, concepts and opinions taken from others. Facts that are commonly known do not need to be footnoted. The number of footnotes you use will depend upon the type of research paper you are writing. There is no fixed number of footnotes required for each page. If you are not sure, use a footnote. It is better to over-document than to omit necessary references and be guilty of plagiarism which is a form of stealing.

REMEMBER:

1. Footnotes give credit to your sources for their concepts, findings, facts, and opinions.
2. Facts commonly known do not need to be footnoted.
3. When in doubt, footnote. Over-documentation is always better than under-documentation.

Primary Footnotes

The standard footnote form should be followed. Refer to the list below when writing a footnote in your paper. Because this is the way your footnotes should appear the first time you refer to a particular source, they are called PRIMARY FOOTNOTES.

For Books:

[1]Bernard Barber, *Research on Human Subjects* (New York: Russell Sage Foundation, 1973), p. 24.

[2]John Bunker, ed., *Costs, Risks and Benefits of Surgery* (New York: Oxford University Press, 1977), p. 12.

[3]E.C. Melby and N. H. Altman, eds., *Textbook of Science* (Cleveland: CRC Press, 1974), 1, p. 61.

For Journals and Magazines:

[4]William Tucker, "Marketing Pollution," *Harper's*, 262 (May 1981), p. 31.

[5]"Scientifically Unsound and Arbitrary," *Chemical Week*, 122 (26 April 1978), p. 31.

[6]Adam Pfeffer, "Toxic Wastes Still Pollute West Side," *Chicago Tribune*, 19 June 1981, p. 1.

[7]"Group Seeks to Rid Beers of Cancer-Causing Agents," *New York Times*, 20 September 1979, p. 14.

For Pamphlets:

[8]*Medical Ethic; Right to Survival*, Report of U.S. Congress Subcommission on Health (Washington, D.C., 1974), p. 16.

For Letters:

[9]Vincent Cusimano, personal letter, 9 September 1981, p. 1.

For Unpublished Materials:

[10]John Smith, "Toxic Wastes and Hazards on Staten Island" (Master's thesis, College of Staten Island, 1980), p. 16.

[11]A.E. Lawson, A.J. Blacke, F.H Nordland, "Training Effects of Control" (Unpublished manuscript, 1980), pp. 12-13.

[12]Robert Schwartz, WCBS Radio, 25 August 1981.

[13]Stephen Halpern, telephone conversation, 1 April 1981.

Note that in the primary footnotes illustrated; the author's name (when known) comes first in normal order with surname last. Commas separate the author from title, facts of publication, and page or pages cited.

Activity No. 7

Examine your classroom texts. Write sample footnotes and bibliography references using at least two of your texts as examples. Follow the format indicated below.

Footnote: Bernard Barber, *Research on Human Subjects* New York: Russell Sage Foundation, 1973, p. 22.

Bibliography: Barber, Bernard, *Research on Human Subjects* New York: Russell Sage Foundation, 1973.

Secondary Footnotes

A second reference to a work already put in a footnote need not be written in an elaborate form. Since most of the information has already been given in the primary footnote, the secondary footnote is briefer.

The following secondary footnotes would be used for citing again the same sources listed above. You will notice much of the previous information has been omitted, but the page number or numbers must always be included.

14. Barber, p. 25.
15. Bunker, p. 122.
16. Melby and Altman, p. 62.
17. Tucker, p. 33.
18. Smith, p. 75.
19. "Scientifically Unsound and Arbitrary," p. 12.
20. "Group Seeks to Rid Beers of Cancer-Causing Agent," p. 15.
21. Pfeffer, p. 4.
22. *Medical Ethics: Rights to Survival*, p. 14.
23. Cusimano, p. 2.
24. Smith, p. 17.
25. Lawson, Blocke, and Nordland, p. 14.

It will probably happen that in your research paper you will use the same source two or more times in succession. In this case the entry you would make in your footnote would be *Ibid.*, which is an abbreviation for the Latin word *Ibidem* meaning "in the same place."

For example, if you had just cited Bernard Barber's book, *Research on Human Subjects*, and immediately referred to it again, you would write *Ibid.*, and the page number if it differed from the previous footnote. Thus using the books, pamphlets, and works that we have mentioned, your list of notes might look something like the following:

[1]Adam Pfeffer, "Toxic Wastes Still Pollute West Side," Chicago Tribune, 19 June 1981, p. 1.

[2]"Scientifically Unsound and Arbitrary," *Chemical Week*, 122 (26 April 1978), p. 11.

[3]Pfeffer, p. 4.

[4]Bernard Barber, *Research on Human Subjects* (New York: Russell Sage Foundation, 1973) p. 24.

[5]John Smith, "Toxic Wastes and Hazards on Staten Island" (Master's thesis, College of Staten Island, 1980), p. 16.

[6]*Ibid.*	(Refers to same page of Smith's thesis.)
[7]*Ibid.*, p. 18	(Refers to different page of Smith's thesis.)
[8]Barber, pp. 27-28	(Note correct abbreviation for pages is pp.)
[9]*Ibid.*, p. 30.	(Refers to Barber's book but a different page.)

The importance of footnotes cannot be over-emphasized. Any information, not of common knowledge, *must* be acknowledged by a footnote. Not to give credit to your source is plagiarism—taking someone else's ideas or work and claiming it as your own. The key to remember is to document all data or ideas obtained from others.

Writing Style

The words you use and the sentences in which you place them constitute your writing style. Almost all students use a familiar style in writing school assignments. However, just as wearing dungarees or sneakers to a wedding would seem wrong because they are out of place, using a conversational style is inappropriate for a formal paper.

There are several points to remember as you write. (1) You should avoid colloquialisms such as "in back of" for "behind" or "beyond", or "most" for "almost." (2) Slang expressions—"swell" as an adjective or "guy" for "person"—should be avoided. (3) Write out the words of contractions. Avoid "can't," "don't" and "it's." (4) A cookbook style which consists of a series of commands should also be avoided. (5) Expressions such as "I think" or "it seems to me" are usually unnecessary since the reader assumes that statements not otherwise documented by footnotes are those of the writer and need no label. (6) Abbreviations may be used if they are explained. This is done by writing out the full name first and then following it by the abbreviation. For example, the Occupational Safety and Health Administration may be followed with the abbreviation, "OSHA." Thereafter OSHA may be used in the paper. Common abbreviations such as Mr., Mrs., Dr., A.M., P.M., etc. need not be explained.

Modesty and courtesy are also important aspects of style. If you find an error in an earlier study, for example, indicate in the spirit of a fellow worker, without superiority or scorn. Immodest expressions such as "I shall inform you" or "I have now informed you" and over-positive statements such as "without doubt" or "obviously" should be avoided. Even if you are positive you are right, use "possibly," "probably," "perhaps," or "it would seem."

Certain unfamiliar punctuation marks may appear in your research of various works. It is important that you know the meaning of these marks to increase your comprehension as well as to enable you to make use of them in your own writing.

A series of three ... spaced periods is called ellipsis. An ellipsis indicated to the reader that certain words in the original have been omitted. If there are four spaced periods, it indicates something is missing from the end of the sentence....

Conversely, brackets [ ] are used to show something other than what the author wrote has been added. Brackets are not parentheses ( ) which are written by the original author. Brackets are usually inserted to explain something vague, confusing, or missing in the cited quotation. For example, "Those [cockroaches] with two normal cerci housed in cups for 30 day retained their ability to turn correctly."

The numerals one to ten should be written out in words. Numbers may be used for higher numerals except at the beginning of a sentence or in a date, volume or page number. In technical or statistical discussions involving their frequent use, numbers may be used.

Revision and Proofreading

Writing is a constant process of revision. As you finish writing each part, remember it is not complete. Reread your paper and correct obvious errors. Then read each part aloud to a classmate. Listen to his criticism and suggestions. If you feel they are valid, modify your paper. Then reread that portion to him again to see if the changes you made improved the paper. In

addition to correcting your errors, an advantage in reading your paper aloud is that you develop a sense of audience. This procedure will enable you to know that you are communicating clearly and effectively.

The number of hours spent in reading, studying, researching, sifting through data, collecting information and writing your paper represents a tremendous investment of your time. Too many students have expended all this effort, only to see it brutally criticized by teachers and reviewers because they did not read through their final paper and correct simple, obvious typing, and grammatical errors. A carelessly written paper, in spite of the time and effort put into it, will not impress the reader.

After your paper has been finished, *read* it again. Go over it carefully. Correct sentence errors, faulty spelling and typing mistakes. Use your dictionary to check words about which you are uncertain. A detailed research paper written for a science forum was entitled "Solid Waste Disposal on Staen Island." The student meant to write *Staten* Island, but didn't. But why didn't she pick up the error before she submitted her paper? The answer is simple. Like so many of us, she was immersed in her work. The research of the paper had taken much effort. When she read through her paper, she saw *what she wanted to see*, not what she had *actually* written.

There are some ways you can help avoid errors like this one. Ask someone else to read your paper. Having a classmate, parent or teacher read your paper can be a great help. He or she has not been involved with the paper as you have. While you, as the saying goes, "may not be able to see the forest because of the trees," someone else can look at your work more objectively.

Another suggestion is to put your paper aside for a while after you have finished it. Allow yourself a time schedule that will give you room enough to finish your paper, leave it alone for a few days, and then come back to it fresh.

Read through your paper slowly and aloud. Try to be objective when you reread. We all tend to like what we have written because it is ours, and we have created it. It is most difficult to destroy what we have created, but it is sometimes necessary in revising and proofreading your paper to eliminate as well as to add. Read and reread your own writing carefully and critically.

Activity No. 8

Read the following sample from a student's research paper. Proofread the passage and revise as necessary. Keep in mind the need for proper spelling, grammar, capitalization, writing style, and accurate documentation.

I think in all area of whether modification where any serious research is underway, the motivation is almost always economic and the immediate need very easily identified. A famers' crops need rain if they are to grow. Leafy crops cut up by hail don't command a decent price at market. Airline which don't have to worry about fog can keep to schedules and show terrific, fantastic profits. Managers of forests can't sell the blackened stumps to nobody after a lightening fire.

I think there are side benefits, too—safety recreation, scenery—but its profit that supports the research. For that reason, I am very impressed by Soviet claims for improved benefit-to-cost ratios in their hail suppression programs even when there cloud-seeding techniques can't be checked. There are successful American commercial cloud-seeding operations which got that way only because farmers were satisfied that they produced needed rain.

I believe the benefit-cost analysis of weather modifications to date, however, yields very grudgingly to the traditional tools of evaluation, tools which Emery N. Castle and Herbert Stoevener have described as "puny and inadequate" for analisis of major climate modification.[1]

I don't mean to say, however, that there has been a complete absence of such efforts. In some cases, indeed, such evaluation has been undertaken and completed. For example, W.B. Beckwith has done some work in deriving actual cost and benefit figures from fog dissipation in commercial aviation, and the Rand Corp has undertaken tornado research related to water supplys.

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[1]W.R. Derrick Sewell. *Human Dimensions of Modification* (Chicago: University of Chicago Press), 1966.

Paper Format

Your research paper will consist of the following parts:

1. Title page—includes title, author's name, subject class and grade, teacher's name, name and location of your school and the date.

2. Text—includes abstract, introduction, paper subsections, conclusions and recommendations. (Footnotes should be included in the text, either at the bottom of each page or on a separate sheet labeled FOOTNOTES immediately following your text.

3. Bibliography—includes all sources you have actually used in the organization of your paper.

Your teacher will give you specific instructions on procedures not covered in this section such as where to place your footnotes. The information outlined here will be standard procedure for the submission of research papers.

The final copy of your research paper must be typewritten on good quality 8½ x 11 inch paper. It is always a good idea to keep a carbon or photo copy of your paper for your own records. Be sure to leave adequate margins on *all* sides of your paper. The standard margins for published scientific manuscripts is a margin of 3 cm. top and bottom and 2.5 cm. on each side. Ample margins allow room for remarks from teachers and reviewers and make reading easier. The text of your paper should be double spaced while footnotes and bibliography are single spaced. Keep in mind you are writing to communicate with someone *else*. Express your thoughts clearly, succintly and accurately.

1. **Title Page**

A cover page should have the title of your paper capitalized and centered. Your name, your subject class and grade, your teacher's name, the name of your school and its location, and the date should be typed in the upper right corner. Do *not* use a cover or binding of any sort for your completed paper. Staple your paper *only* in the upper left corner.

2. **Text**

A. Abstract

The abstract allows the reader to survey the contents of your paper at a glance. It should summarize what your paper is all about. It should be self-contained and give a statement of the problem you have researched, the methods of your research, the results of your findings, and your conclusions and recommendations. In other words, it must summarize your data and findings within the space of 100-150 words!

Because of the difficulty in compressing so much information into such a small space, students usually find the abstract a problem. If you leave it until you are finished writing your paper, you will find it much easier to abstract or paraphrase what you have written.

REMEMBER:

> Your abstract should be short, accurate, easy to understand, and informative.

The abstract immediately follows your title page, and the word *ABSTRACT* should be typed in capital letters at the top.

B. Introduction

The page following the abstract should be titled *INTRODUCTION* (capitalized and centered at the top). The purpose of your introduction is to inform the reader of the specific problem under study and the research that has been done on it. Limit this part of your paper to one or two pages. Give your reader what the point of your research is and what the implications of the problem discussed are.

A good introduction is like a store window. It shows the reader what is inside and attempts to attract his attention enough so that he will want to investigate further. The introduction is an important part of your paper. It should interest the reader. There is no reason for introductions to be drab and boring. Certain techniques such as beginning with a question or a surprising statement of fact can quickly get the reader's attention and get him involved.

C. Thesis and Subsections

As mentioned previously your preliminary outline will change as your reading, research and knowlege of your subject grows. As you accumulate more and more notes, you should try to pin-point your theme (main idea). What is the focus of your paper? What are you trying to show? The clearer your idea of what you are doing, the easier it will be to get this idea across to your reader.

The thesis of your paper is important. It is a statement to be proved or maintained against objections. Think of a rifleman aiming at a target. The target is your thesis. The more accurately and carefully the rifleman aims at his target, the better his chances are of hitting the bull's eye. You can hit the "bull's eye" in your research paper if you can tell in one sentence what your reader will learn about your topic after reading your research paper. The one sentence summary of your theme will be your target. Keeping this in mind, now organize your outline and your notes specifically to hit this target.

Subsections in a science research paper would follow your outline headings. Your general section should include, in addition to an abstract and an introduction, sections that refer to analysis, assessment, conclusion and recommendations. These sections can be broken down into subsections depending upon your specific topic, outline, and discussion.

Subsections should be capitalized on a separate line, beginning at the left margin of your page and separated by two blank lines above and below. A subsection heading, however, should never be placed at the bottom of a page unless there is room for at least one line of text.

Activity No. 9

What is the thesis of the following passage?

> A look through a microscope at a piece of wood will reveal it is made up of thousands of hollow cells. These natural building blocks are formed with walls composed of tiny cellulose fibers. If all the fibers in one cubic inch of wood could be individually counted, there would be close to three million of them. The tough cellulose fibers and the cells they form are cemented together by a natural glue called lignin. Lignin bonds so tenaciously to cellulose the two were once considered to be a single substance. Paper is made from the wood fibers after the lignin is removed. Later, the lignin can yield many useful chemicals including the basis for artificial vanilla flavoring. This unique cellular structure of wood is what gives it so many amazing properties. No other material has qualities quite like wood.

D. Conclusions and Recommendations

The conclusion of your research paper calls for critical thought and evaluation. You will have discussed in the previous parts of your paper the data you have found from your investigation of primary and secondary sources. The conclusion is the place in which you bring all this information to focus on the problem you have been studying. Your conclusion will, therefore, answer questions which have been raised in the study.

To get a good idea of what your conclusion should be, look at your thesis sentence. If you wrote it correctly, it should have told you what you planned to say in the paper. Following that thesis sentence, you then wrote the text, and said it. Now your conclusion will show to the reader what you have said and why you favor a particular point of view. Remember in the conclusion you must be able to defend your thesis.

Included in your conclusion should be a subsection on recommendations. You are free to make whatever suggestions you deem necessary. Remember, however, your recommendations must be *objective* (not emotional) and they must be *specific*. Broad statements such as "This regulation should be changed" or "The public must be better informed" or "All segments of society must be involved in decision making" are far too general. Suggest concrete, specific ways in which your recommendations can be implemented.

Your discussion in the conclusion reflects your own thinking based on your research. Readers pay particular attention to this section because it demonstrates your comprehension of the problem. The last thing a person reads is often the thing he or she remembers most. Keep this in mind when you organize your conclusion.

3. Bibliography

This is the final section of your paper. Your final bibliography will probably have changed much from your preliminary one. The bibliography goes on a separate page with the word *BIBLIOGRAPHY* capitalized and centered at the top. The sample entries below are how the bibliography should be written for the footnote illustrations given in the previous section. Comparing the two sections you can see variations in the form of both entries. Notice for example, in the bibliography the use of periods instead of commas and the position of the author's surname and first name.

Sample Bibliography Entries:

Barber, Bernard. *Research on Human Subjects.* New York: Russell Sage Foundation, 1973.

Bunker, John P., editor. *Costs, Risks and Benefits of Surgery.* New York: Oxford University Press, 1977.

Cusimano, Vincent. Personal letter. 9 September 1981.

"Group Seeks to Rid Beers of Cancer-Causing Agent." *New York Times,* 20 September 1979, p. 14.

Halpern, Stephen. Telephone conversation. 1 April 1982.

Lawson, A.E., A.J.K. Blacke, F.H. Nordland. "*Training Effects of Control.*" Unpublished manuscript, 1980.

Melby, E.C. and N.H. Altmman, editors. *Textbook of Science*. Volume 1. Cleveland: CRC Press, 1974.

Pfeffer, Adam. "Toxic Wastes Still Pollute West Side." *Chicago Tribune*, 19 June 1981, pp. 1-2.

Schwartz, Robert. WCBS Radio. 25 August 1981.

"Scientifically Unsound and Arbitrary." *Chemical Digest*, 122 (April 1981), pp. 10-22.

Smith, John. "Toxic Wastes and Hazards on Staten Island." Unpublished master's thesis: College of Staten Island, 1980.

Tucker, William. "Marketing Pollution." *Harper's*, 262 (May 1981), pp. 31-38.

United States Congress Subcommission on Health. *Medical Ethnic Right to Survive*. Washington, D.C.: Report of U.S. Congress Subcommission on Health, 1974.

Research Paper Timetable

1. Date for Selection of Topic _____

2. Date for Submission of Topic _____

3. Date for Submission of Preliminary Bibliography _____

4. Date for Submission of Preliminary Outline _____

5. Date for Submission of Additional References _____

6. Date for First Draft of Paper _____

7. Date for Submission of Final Paper _____