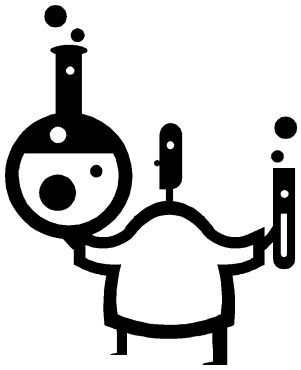
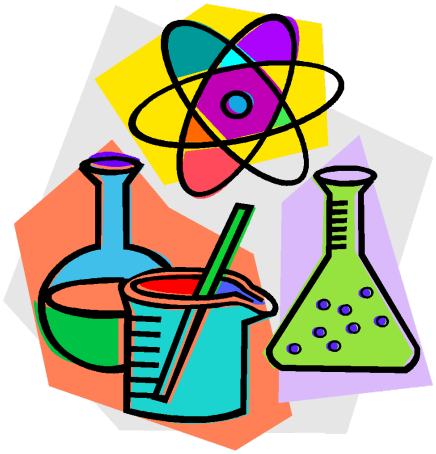


Science Fair Project
Student's Guide

Grade 5 - 8

Revised October 2017



Project Categories and Ideas

Students are to design an experiment to investigate a question or problem. **A MODEL OR DEMONSTRATION IS NOT AN ACCEPTABLE PROJECT.**

Aerospace Science is the science of the investigation of the earth's atmosphere and outer space. This would include the design, manufacture, and operation of aircraft.

How does weight affect the flight of airplanes?
What kind of fabric makes the best parachute?
Does the fin shape of model rockets have any effect on altitude?

Astronomy is the science dealing with all of the celestial bodies in the universe, including the planets and their satellites, comets and meteors, the stars and interstellar matter, the star systems known as galaxies and clusters of galaxies.

Conduct a mathematical study of the chemical composition of celestial bodies.
What are the effects of solar flares on radio or TV transmissions?

Behavioral Science* is the science that studies the demeanor or deportment of humans and other animals by means of observable response and the interpretation of the same as offered by the social sciences: sociology, psychology, etc.

Does color make a difference to taste?
Does age affect reaction time?
How does playing video games affect pulse rate?
Do boys or girls have better short term memory?

Biochemistry* is the branch of chemistry relating to the processes and physical properties of living organisms.

Which foods contain the most starch?
Which bread molds the fastest?
Does cake or dry yeast work better?

Botany is the division of biology that deals with plant structure, reproduction, physiology, growth, classification, and disease.

Do magnets affect plant growth?
Which method grows plants better – hydroponics or soil?
How does soil composition affect seed germination?
How do different colors of light affect plant growth?

Chemistry is the science that deals with the structure, composition and properties of substances and their transformation.

What is the pH of different soaps (detergents)?
What colors are really in black ink?
Which substances clean pennies the best?
What types of cups insulate the best?
Which detergent breaks down oil the fastest?

Computer Science includes the study and development of computer hardware, software engineering, internet networking and communications, graphics, simulations/virtual reality or computational science.

Is there a significant difference in computer speeds?
Write an original program for tutoring a foreign language.
Develop a program to do repetitive experiments/tests.

Consumer Science* is the study of comparisons and evaluations of manufactured or commercial products.

Which antiseptic kills the most germs?
Which toothpaste removes the most stain?
Which brand of soda has the most fizz?
Which glue holds the best?
Which dishwashing liquid makes the most suds?
Which type of surface is best for in-line skates?

Earth Science is the science concerned with the origin, structure, composition and other physical features of the earth.

What is the best drainage material?
What material makes the best water filter?
How can water be made wetter?

Electronics is the branch of engineering and technology that deals with the manufacture of devices such as radios, television sets and computers.

What types of materials make the best amplifiers?
Which type of wires has the least resistance?

Engineering is concerned with the practical application of scientific knowledge in the design, construction and operation of roads, bridges, harbors, buildings, machinery, lighting, heating and communication systems.

Which retaining wall design is the strongest?
Which bridge design is the strongest?
Which wood absorbs the most water?

Environmental Science is the study of the protection and care of natural resources.

How does acid rain affect plants?
How does color affect a compost bin's effectiveness?
What is the best shape for a compost bin?

Health Science* is the science concerned with the study of the human body and good health practices.

Which aerobic exercise has the greatest effect on heart rate?
Which hand soap kills bacteria the best?
Which antacid works the best?
How do your daily activities affect your height?

Materials Science is the study of materials, nonmetallic as well as metallic, and how they can be adapted and fabricated to meet the needs of modern technology.

Which materials are best to carry a current?
Which type of decking weathers the best?
Plastic or wood – Which one would you use?

Mathematics is the science dealing with measurement, properties, and relationships of quantities as expressed in numbers or symbols.

What numbers appear most frequently in the lottery?
Does the first selector or the second selector have the better chance of selecting the correct number?

Microbiology* is the branch of biology concerned with the study of microorganisms.

Do microorganisms really speed up decomposition?
Which is the best disinfectant?
Do antibacterial soaps really work better than plain soaps?

Physics is the science that deals with the laws governing motion, matter and energy under precise observation.

Which insulation retains the most heat?
Does the shape of the container affect freezing time?
At what temperature will Silly Putty stretch the most?

Zoology* is the science that deals with animals with reference to their structure, functions, development, evolution and classification.

Can fish be trained to respond on cue?
What is the effect of sugar on mealworms?
What colors attract the most insects?

*Projects in these categories may need an endorsement.

Choosing a Topic

- **Be creative!** Plan a project that is original in plan or execution. The project should express scientific ideas in new or better ways.

- **Be scientific!** Investigate and explore a topic that arouses your curiosity or fascinates you. The library is an excellent place to begin your research.

- The student should consider the research problem in relation to his or her scientific background, desire to contribute to science, the time required for the student, and the availability of resources and materials.

- It is important that each project have a central theme or purpose, that is, to answer a definite scientific question or to solve a problem.

- The demonstration of good science matters much more than the choice of topic. Sometimes the simplest topic offers the greatest challenge to the imaginative and intelligent.
- Start planning early in the year.

- Be realistic about the amount of time needed. Establish a manageable timeline to avoid the last minute rush and stress.

Stating the Purpose

1. Determine the question or the purpose of the experiment.

2. Make certain it is an experiment or investigation and **not a model.**

   Example: What is the best insulator to keep ice from melting?

3. State how you will make your measurements and what metric units (if appropriate) you will be using.

   Example: I will weight the ice using a metric scale to determine the weight in grams.

Writing the Abstract

The abstract is a concise summary of your work and it is the first page of your paper.

1. The abstract should be typed in paragraph form, using a maximum of 200 words. There should be 3 paragraphs that address the following. Label each paragraph.

   A. Purpose: What question are you trying to answer?
   B. Procedure: How are you doing your experiment?
   C. Conclusion: What did your tests prove or what were your findings?

2. You must use the correct format for the abstract. A sample abstract is included in this packet. You must use this format when you type the abstract.

Variable

Independent or manipulated variable: This is the part of the experiment that the student changes.

Example: The variable is the use of the various types of insulating materials.

Dependent or respondent variable: What happens in the experiment based upon what was changed?

Example: The amount that the ice melts in a set time period with each type of insulation would be the change.

Variables to control:

1. All of the ice should be the same size and weight at the beginning of each test.
2. The amount of insulating materials used should be the same in each test.
3. The same metric scale should be used each time.
4. The room temperature where the tests are being conducted should be the same.
5. The experiment procedure must be the same each time.
6. The time the ice is left in the insulating materials should be the same each time.

Reference Topics

1. Each type of insulating materials should be researched.
2. How does ice form?
3. What causes ice to melt?
4. What are some of the uses of ice?
5. What are some of the uses of insulating material?

Using the Scientific Method

- Formulate Your Research Objectives
  Decide what question you want to answer or what problem you want to investigate. Be sure to have adequate technical and financial resources, as well as time, available to conduct your research. State your objective clearly in writing.

- Perform Background Research
  Before you begin your project, you must become as knowledgeable as you can about your topic and about what other research has been done. You may use books, scientific literature, the internet, or interviews with scientists or other knowledgeable people. This research not only helps you get ready to conduct your experiment, but will form the background for the review of literature required in your report.

- Formulate a Hypothesis
  Based on the background research, write a statement that predicts the outcome of the experiment. Many hypotheses are stated as "if…then" statements in which the "if" clause pertains to the independent variable and the "then" clause pertains to the dependent variable. For example, if plants are grown under various colors of light, then the plants grown under blue and red lights will show the greatest increase in biomass.

- Design the Experiment
  Decide what data you need to meet your research objective. Determine how you can conduct your research safely. If you are using vertebrates in your research, you must follow the rules for their use. In order to obtain valid experimental results, consider the following when designing the experiment:
    a. Make sure the quantity and quality of data you collect provide a reasonable assurance that your research objectives will be met.
    b. Identify all <u>important</u> variables that could affect your results.
    c. Control any important variable not manipulated in your experiment as much as possible.
    d. Include a control or comparison group in your experimental design.

  Be sure to establish deadlines for completing the different phases of your research. These phases might include building equipment, collecting data, analyzing the results, writing the report, and making your display board. Remember to use <u>metric measurements</u> whenever possible.

- Conduct the Experiment
  Follow your experimental design to collect data and make observations. Be sure to keep a log as you conduct the experiment to record your data, any problems you encounter, how you addressed them, and how these problems might have affected your data. This log will be used when you write your report.
  Keep these points in mind when conducting your experiment:
    a. If you get results that seem wrong or inconsistent, don't discard. Try to determine what happened. Maybe the data is correct and your hypothesis is wrong. Try to explain the inconsistencies in your report.
    b. Don't get discouraged when you have problems. Scientists often have to repeat experiments to get accurate, reliable results. Sometimes you can learn more from a failure than you can from a success.

- **Report the Results**
  Your report should provide all the information necessary for someone who is unfamiliar with your project to understand what you were trying to accomplish, how you did the project, and whether you succeeded. It should be detailed enough to allow someone else to duplicate your experiment exactly. Be sure to include charts and graphs to summarize your data. The report should include your problems and their solutions as well as your successes.

  You will also need to have a visual display as well as an oral report about your project.

Planning an Attractive Exhibit

- The student should construct the exhibit with the parent, teacher or sponsor providing guidance and encouragement.
- The title should be brief, captivating, and sufficiently descriptive to identify the project.
- Lettering should be neat, easily visible, and uncluttered.
- Make certain all words are spelled correctly.
- Exhibits should be as neat and presentable as possible.
- The exhibits should be colorful.

Researching the Topic

1. Use the Library
    a. Encyclopedias or other reference books are a good place to begin. (NOTE: No more than 2 encyclopedias should be used.)
    b. Electronic card catalog will help you locate books on your subject.
    c. Use the internet to locate information, including magazine articles. Magazine articles that are more than 4 years old should not be used except as background/historical information.

2. Experts and Companies
    a. Contact people who work in areas related to your topic. Example: If you are using plants, talk with a botany professor at SIUE or Lewis and Clark Community College or a greenhouse employee.

3. Related Topics
    If you cannot find enough information on your specific topic, you will need to research related topics. Example: If you are using catsup, you can research the ingredients used in the catsup as well as the process of making it.

4. Taking Notes
    a. You may wish to photocopy large sections of information from a research source and take notes on that information later.
    b. You will need to take notes on the information you have read on your topic and conversations you will have with experts on the topic.
    c. Be careful to record the source of the information and other facts about the source to compile a reference list.
    d. It is NOT acceptable to download information or copy information and use that as your research. **The research report must be in your own words.**

5. References
    The correct format for a reference list is contained in this booklet.

Planning the Experiment

1. **Independent or manipulated variable** is the factor or variable that you changed in the experiment.
State the independent variable in your experiment:_____
_____

2. **Dependent or respondent variable** is what changed in the experiment when you applied the independent variable. The independent variable is what you will be measuring in the experiment.
State the dependent variable: _____
_____
Example: The dependent variable would be the growth of the plants in the different brands of potting soil.

3. **Hypothesis** is a specific prediction based upon what you have learned about your topic after doing the research but before conducting the experiment.
State your hypothesis: _____
_____

4. **Control other variables** as it is important and necessary to follow the same procedure and conditions for each trial test conducted in the experiment to assure that the independent or manipulated variable is causing the change in your experiment and not another variable. You may need a control group to use as a comparison for the experimental group. A control group is a group which is treated the same as the experimental groups except there is no variable applied.

5. **Materials** are a list of all the items, including equipment that you will be using to conduct the experiment. The list needs to be specific.

6. **Measurements** used in your experiment and/or in reporting the results should be in metric units if at all possible.

CONDUCTING THE EXPERIMENT

Step 1. Before beginning the experiment, you should plan a timeline for conducting the experiment.

Step 2. During the experiment, you should keep a log book. In the log book, state what you did on each date and any observations that you made.

Example of Log Book Format

Date	Activity	Observations
11/2	Watered radish seeds with 5 mls	Leaves starting to appear

Step 3. When you begin collecting data, you will need to prepare a data table. The data table format depends upon the experiment you are conducting.

Step 4**.** Remember to take **photos** as you are conducting the experiment.

Step 5. Be sure to repeat the experiment or have sufficient representation to assure validity of your results. If you are using plants, for example, you have to have at least 3 plants in each group including the control group. When repeating the experiment, the same procedure must be followed each time.

Step 6. After completing the experiment, you will need to construct graphs or display your results in a clear manner.

a. **Line graphs** are used to show changes in data over a period of time. Example: A line graph is appropriate to show plant growth.
b. **Bar graphs** are used to compare values or for comparisons for one specific time period. Example: If you are graphing the weight a garbage bag can hold, a bar graph would be appropriate.
c. The independent or manipulated variable should be on the x-axis and the dependent or respondent variable on the y-axis. Be sure to label your graphs.

Step 7. You should form conclusions from your results.

a. The first conclusion statement should relate the results to the hypothesis. There are no right or wrong results if your experiment is done accurately. If your results do not support your hypothesis, it's okay.
b. The second conclusion statement should relate to the specific data you collected.

Step 8. You have now completed the investigation stage and are ready to complete your paper and make your display in preparation for the Science Fair.

THE DISPLAY BOARD

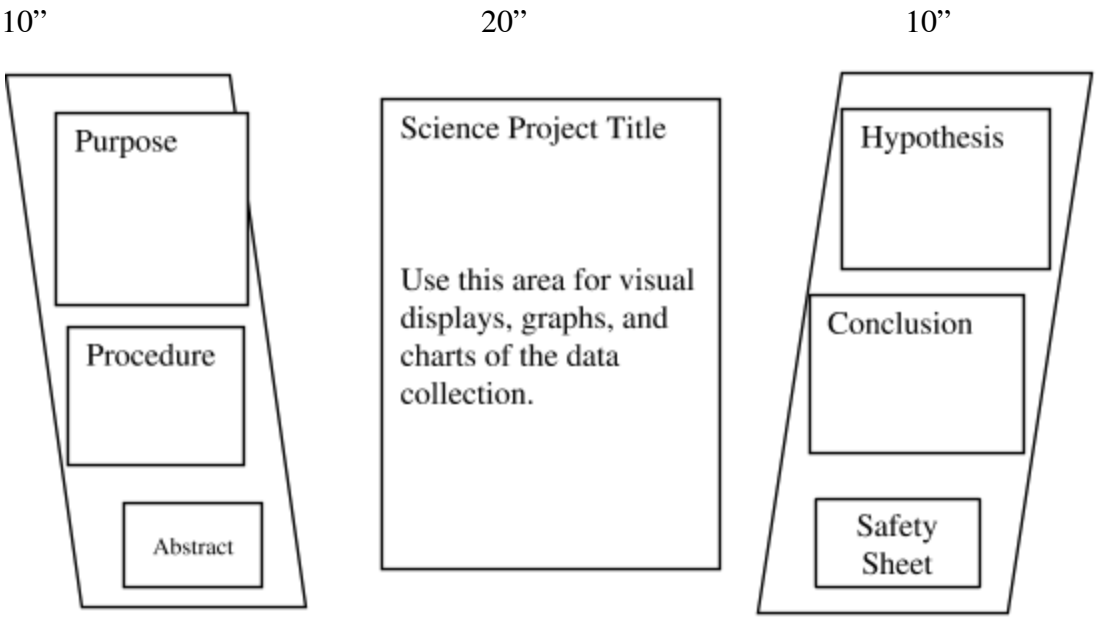
1. SIZE

   A. Maximum

      1. 122 cm (48 inches wide)
      2. 122 cm (48 inches high)
      3. 76 cm (30 inches deep)

   B. 30” X 40” Fome-Cor ® Board is most often used

      1. Approximately 20 inches wide
      2. 30 inches high
      3. Approximately 15 to 20 inches deep



Your paper must be displayed on the table

Correct Order for the Written Report

Abstract

1. It is a concise summary of your work.
2. A sample abstract is included in this packet. Use this format when typing the report.
3. The abstract **must** be 3 typed paragraphs. Use only the front side of the paper.

Safety Sheet - All projects must have a safety sheet with all safety hazards identified. If no safety hazards exist, a statement to that effect must be made. The safety form must be used.

Endorsements - When humans are test subjects or non-human vertebrates are used, endorsement sheets are required. The endorsement form must be used.

Title Page –The title should be concise, clear, and interesting. Your name, grade, and school should be included on the title page.

Table of Contents - List all the parts of your paper and include page numbers.

Acknowledgments - This gives credit to those who helped you in your project – guidance, materials, and/or use of facilities.

Purpose and Hypothesis - The purpose states precisely the question you are investigating. The hypothesis is what you thought the results of your tests would be.

Review of Literature – The review of literature summarizes information and/or work done in the past that pertains to your project. The references used should be properly documented and listed on the reference page. Footnotes should not be used. The correct citation method is provided in this booklet.

Materials and Methods of Procedure -List all materials and equipment used in your investigation. If any apparatus is constructed, an explanation of the device should be included. Diagrams may also be included. The explanation of the procedure should be clear and detailed enough that the procedure may be duplicated.

Results – All results should be organized into tables and/or charts. Appropriate graphs that are clearly labeled and easily understood should be included. If quantitative data is not involved, a day-by-day log may be used in place of tables, graphs, and charts. An explanation of your evaluation and interpretation of the data and/or results should also be included.

Conclusion –The conclusion concisely evaluates and interprets the data and/or results. The conclusion should be limited to the results of the investigation and should refer to the stated purpose and hypothesis.

References –List all published articles, books, and other communications cited in the paper. The reference page should begin on a new page separate from the text of the essay. Sources should be current. References are arranged alphabetically according to the author/editor's last name (when it is known) or the first significant word in the title if the author/editor is not known. The correct style and format is included in this booklet.

APA Formatting Guide

The correct style to use for citing references is discussed in detail in the *Publication Manual of the American Psychological Association, Sixth Edition.* Information in this handout is based on information available at the *Purdue University Online Writing Lab (OWL)* at http://owl.english.purdue.edu .

The essay should be typed, double-spaced on standard-sized paper (8.5" x 11") with 1" margins on all sides. You should use 10-12 pt. Times New Roman font or a similar font.

Include a **page header** at the top of every page. To create a **page header**, insert page numbers flush right. Then type "TITLE OF YOUR PAPER" in the header flush left.

The paper should include **four** major sections: the **Title Page**, **Abstract**, **Main Body**, and **References.**

Title Page

The title page should contain the **title** of the paper, the **author's name**, and the **school name**. Include the page header flush left with the page number flush right at the top of the page. On the title page, your page header should look like this:

Running head: TITLE OF YOUR PAPER

Pages after the title page should have a running head that looks like this:

TITLE OF PAPER

Type your **title** in upper and lowercase letters centered in the upper half of the page. The title should be no more than 12 words in length and it should not contain abbreviations. **All text on the title page, and throughout the paper, should be double-spaced.**

Beneath the title, type your name.

Beneath your name, type the school name.

Reference List: Basic Rules

The reference list should appear at the end of the paper. It provides the information necessary for a reader to locate and retrieve any source cited in the body of the paper. Each source cited in the paper must appear on the reference list. Each entry in the reference list must be cited in the text.

References should begin on a new page separate from the text of the essay. Label this page **References** centered at the top of the page. (Bold **References**.) All text on this page should be double-spaced just like the rest of the essay.

- All lines after the first line of each entry in the reference list should be indented one-half inch from the left margin. This is called hanging indentation.

- Authors'names are inverted (last name first). Give the last name and initials for all authors of a work unless the work has more than six authors. If the work has more than six authors, list the first six authors and then use "et al." after the sixth author's name to indicate the rest of the authors.

- Reference list entries should be alphabetized by the last name of the first author of each work.

- When referring to any work that is NOT a journal, such as a book, article, or Web page, capitalize only the first letter of the first word of a title and subtitle, the first word after a colon or a dash in the title, and proper nouns.

- Capitalize all major words in journal titles.

- Italicize titles of longer works such as books and journals.

- Do not italicize, underline, or put quotes around the titles of shorter works such as journal articles or essays in edited collections.

Reference List: Author/Authors

The rules for handling works by a single author or multiple authors apply to all APA-style references in the reference list, regardless of the type of work (book, article, electronic resource, etc.).

One author:

Last name first, followed by author initials.

Berndt, T. J. (2002). Friendship quality and social development. *Current Directions in Psychological Science, 11,* 7-10.

Two authors:

List by their last names and initials. Use the ampersand instead of "and."

Wegener, D. T., & Petty, R. E. (1994). Mood management across affective states: The hedonic contingency hypothesis. *Journal of Personality & Social Psychology, 66,* 1034-1048.

Three to Six Authors

List by last names and initials; commas separate author names; the last author name is preceded by the ampersand.

Kernis, M. H., Cornell, D.P., Sun, C. R., Berry, A., Harlow, T., & Bach, J.S. (1993). There's more to self-esteem than whether it is high or low: The importance of stability of self-esteem. *Journal of Personality and Social Psychology*, 65, 1190-1204.

Unknown author:

Merriam-Webster's collegiate dictionary (10th ed.). 1993). Springfield, MA: Merriam-Webster.

Note: When you include parenthetical citations of sources with no author named, use a shortened version of the source's title instead of an author's name. For example, a parenthetical citation of the above source would appear as follows: (*Merriam-Webster's*, 1993).

Organization as author

American Psychological Association. (2003).

Reference List: Articles in Periodicals

Last name followed by initials. The publication year goes between parentheses, followed by a period. The title of the article is in sentence-case, meaning only the first word and proper nouns in the title are capitalized. The periodical title is run in title case, and is followed by the volume number which, with the title, is also italicized or underlined.

Author, A., Author, B, & Author, C. (Year). Title of article. *Title of Periodical, volume number* (issue number), pages.

Article in journal paginated by volume

Journals that are paginated by volume begin with page one in issue one and continue numbering issue two where issue one ended, etc.

Harlow, H.F. (1983). Fundamentals for preparing psychology journal articles. *Journal of Comparative and Psychological Psychology,* 55, 893-896.

Article in journal paginated by issue

Journals paginated by issue begin with page one in every issue. The issue number is indicated in parentheses after the volume. The parentheses and issue number are not italicized or underlined.

Scruton, R. (1996). The eclipse of listening. *The New Criterion*, *15*(30), 5-13.

Article in a magazine

Henry, W.A., III. (1990, April 9). Making the grade in today's schools. *Time, 135,* 28-31.

Article in a newspaper

Unlike other periodicals, p. or pp. precedes page numbers for a newspaper reference.

Schultz, S. (2005, December 28). Calls made to strengthen state energy policies. *The Country Today*, pp. 1A, 2A.

Reference List: Books

One author:

Author's last name, initial. (Year of Publication). *Title of wor*k. Location: Publisher.

Arnheim, R. (1971). *Art and visual perception*. Berkeley, CA: University of California Press.

Note: For "Location," you should always list the city, but you should also include the state if the city is unfamiliar or if the city could be confused with one in another state.

Edited book, no author:

Maher, B.A. (Ed.). (1972). *Progress in experimental personality research.* New York: Academic Press.

Article or chapter in an edited book:

O'Neil, J. M., & Egan, J. (1992). Men's and women's gender role in journeys: Metaphor for healing, transition, and transformation. In B. R. Wainrib (Ed.), *Gender issues across the life cycle* (pp. 107-123). New York: Springer.

Other print sources

An entry in an encyclopedia:

Bergmann, P.G. (1993). Relativity. In *The new encyclopedia britannica* (Vol.26, pp. 501-508). Chicago: Encyclopedia Britannica.

Government document

National Institute of Mental Health. (1990). *Clinical training in serious mental illness* (DHHS Publication No. ADM 90-1679). Washington, DC: U.S. Government Printing Office.

Reference List: Electronic Sources

Article from an online periodical

Online articles follow the same guidelines for printed articles. Include all information the online host makes available.

Author, A. A., & Author, B. B. (Date of publication). Title of article. *Title of online periodical, volume number* (issue number if available). Retrieved from http://someaddress.com/full/url/

Bernstein, M. (2002). 10 tips on writing the living Web. *A List Apart: For People Who Make Websites, 149.* Retrieved from http://www.alistapart.com/articles/writeliving

Article from an online periodical with DOI assigned

A DOI is a Digital Object Identifier. DOI's are an attempt to provide stable, long-lasting links for online articles.

Brownlie, D. Toward effective poster presentations: An annotated bibliography. *European Journal of Marketing, 41* (11/12), 1245-1283. doi:10.1108/03090560710821161

Online newspaper article

Parker-Pope, T. (2008, May 6). Psychiatry handbook linked to drug industry. *The New York Times.* Retrieved from http://www.nytimes.com

Online encyclopedias and dictionaries

When no byline is present, move the entry name to the front of the citation. Provide publication dates if present and indicate no date (n.d.) if no date is present in the entry. When using the URL, give only the home or index root.

Feminism. (n.d.) In *Encyclopedia Britannica online*. Retrieved from http://www.britannica.com

Nonperiodical web document, web page, or report (If there isn't a date available for the document use (n.d.) for no date.

Author, A. A., & Author, B. B. (date of publication). Title of document. Retrieved from http://web address

Interviews, Email, and other personal communication
No personal communication is included in the reference list. Instead, parenthetically cite the communicator's name, the fact that it was personal communication, and the date of the communication in your main text only.

A. P. Smith also claimed that many of her students had difficulties with APA style (personal communication, October 10, 2009).

Motion picture or videotapes:

Smith, J.D. (Producer), & Brown, A.F. (Director). (2001). *Really big disaster movie* [Motion picture]. United States: Paramount Pictures.

Music recording:

Songwriter, W.W. (Date of copyright). Title of song [Recorded by artist if different from song writer]. On *Title of album* [medium of recording]. Location: Label. (Recording date if different from copyright date.).

Taupin, B. (1975). Someone save my life tonight [Recorded by Elton John]. On *Captain fantastic and the brown dirt cowboy* [CD]. London: Big Pig Music Limited.

Format for Parenthetical Citation within the Text of the Review of Literature

Direct Quotations of Sources

Quotations of less than 40 words should be incorporated in the text and enclosed with quotation marks. Using the "author-date method" of citation, the quotation is followed with a reference to the author, the publication year, and the page number. These elements must be enclosed in parentheses, together or separately. A complete reference must appear in the reference list at the end of your paper.

> He stated, "The 'placebo effect,'… disappeared when behaviors were studied in this manner" (Smith, 1982, p. 276), but he did not clarify which behaviors were studied.
>
> Smith (1982) found that "the 'placebo effect,' which had been verified in previous studies, disappeared when (his own and others') behaviors were studied in this manner" (p. 276).

Place direct quotations longer than 40 words in a free-standing block of typewritten lines, and omit quotation marks. Start the quotation on a new line, indented five spaces from the left margin. Type the entire quotation on the new margin, and indent the first line of any subsequent paragraph within the quotation five spaces from the new margin. Maintain double-spacing throughout. The parenthetical citation should come after the closing punctuation mark

Smith (1982) found the following:

> The "placebo effect," which had been verified in previous studies,
>
> disappeared when behaviors were studied in this manner. Furthermore,
>
> the behaviors, *were never exhibited* (italics added), even when reel (sic)
>
> drugs were administered. Earlier studies were clearly premature in
>
> attributing the results to a placebo effect (p. 276).

Reference Citations in the Text

Paraphrasing

Whenever using your own words to refer indirectly to another author's work (paraphrasing), you must identify the original source. The "author-date method" of citation is used for this purpose, but without quotation marks. A complete reference must appear in the reference list at the end of your paper.

Examples:

One work by a single author:

The surname of the author and the year of publication are inserted in the text at the appropriate point. If this information appears as part of the narrative, it need not be cited again:

Smith (1983) compared reaction times

Within a paragraph, you need not include the year in subsequent references to a study as long as the study cannot be confused with other studies in the article:

Smith (1983) compared reaction times… Smith also found

One work by two or more authors:

When a work has two authors, cite both names every time the reference occurs in the text:

as James and Ryerson (1983) demonstrated

as has been shown (James and Ryerson, 1983).

When a work has more three to five authors, list all authors the first time. *In subsequent citations include only the first author's last name followed by "et al." and the year:*

(Williams, Jones, Smith, Bradner, &Torrington, 1983)

(Williams et al., 1983)

When the reference is to a work by a corporate author, use the name of the organization as the author.

Retired officers retain access to all the university's education and recreational facilities (Columbia University, 1987).

If the author is unknown or unspecified, use the first few words of the reference list entry (usually the title). Title of book and reports are italicized or underlined; titles of articles and chapters are in quotation marks.

Misbehaviors were found to reduce to three factors; incompetence, offensiveness and indolence (*The Study Finds*, 1992).

A similar study was done of students learning to format research papers ("Using APA," 2001).

When an electronic source lacks page numbers, try to include information that will help readers find the passage being cited. If an electronic document has numbered paragraphs, use the abbreviation "para." followed by the paragraph number (Smith, 1998, para.5).

Never use the page numbers of Web pages you print out; different computers print Web pages with different pagination.

***Additional explanations and information about APA Formatting may be found in these resources**. *

1. *Publication Manual of the American Psychological Association, Sixth Edition*

2. Purdue University Online Writing Lab (Owl)
   APA Formatting and Style Guide
   http://owl.english.purdue.edu/

References

Purdue University Online Writing Lab (OWL) (9 Oct. 2009). *APA Formatting and Style Guide.* Retrieved October 12, 2009, from http://owl.english.purdue.edu/

SAMPLE **ABSTRACT** **SAMPLE**

The Illinois Junior Academy of Science

This form/paper may not be taken without IJAS authorization.

CATEGORY _____ STATE REGION # **12**

SCHOOL _____ IJAS SCHOOL # **12115**

CITY/ZIP _____ SCHOOL PHONE # _____

SPONSOR _____

MARK ONE: EXPERIMENTAL INVESTIGATION ☐ DESIGN INVESTIGATION ☐

NAME OF SCIENTIST* _____ GRADE _____

NAME OF SCIENTIST _____ GRADE _____

NAME OF SCIENTIST _____ GRADE _____

NAME OF SCIENTIST _____ GRADE _____

* If this project is awarded a monetary prize, the check will be written in this scientist's name, and it will be his/her responsibility to distribute the prize money equally among all participating scientists.

PROJECT TITLE Cold- Medium- Hot

Purpose: Determine the effect that the temperature of the water used to water plants will have on the plants

Procedure:

1. **Using 4 of the same kind of plants for each water temperature and 4 plants as the control, place the plants in the same location and in the same type of containers and in the same potting soil. Mark each group of plants**
2. **After recording the height of the plants, add 25 ml of water to each plant making certain the correct temperature of water is added to the correct plant. (The groups are 40, 20 and 1 degree Celsius. The control group receives room temperature water. The temperature of this water will be measured and the same temperature used each time)**
3. **The plants should be watered with the correct temperature of water for the group every 5 days for a period of 60 days.**

The height of the plants, as well as the general appearance, will be recorded each time the plants are watered.

Conclusion: At the end of the 60 day experiment period, the plants that were watered with the 40 and 1 degree Celsius water were either dead or had grown less than 8 cm. The plants that were watered with the 20 degree Celsius water had grown 20 cm. which nearly matched the control group which had grown 23 cm. The 20 degree Celsius water was nearest in temperature to the room temperature water which was used to water the control group and that is why those groups were nearly even.

1) Limit Abstract to 3 paragraphs (about 200 words or less). a) Purpose - what you set out to investigate; b) Procedure - how you did it; c) Conclusion - based on your results. Label each paragraph.
2) Must be typed, single-spaced on the front of this form. Do not write on the back of this form.
3) Three copies of your complete paper are required at the State Science Project Exposition.

Four copies of your complete paper are required for the State Paper Session Competition.

This form must be used. This form **must** be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of 8.5 inches (vertical) X 5.5 inches (horizontal).

ABSTRACT

The Illinois Junior Academy of Science

This form/paper may not be taken without IJAS authorization.

CATEGORY		STATE REGION #	**12**
SCHOOL		IJAS SCHOOL #	**12115**
CITY/ZIP		SCHOOL PHONE #	
SPONSOR			

MARK ONE: EXPERIMENTAL INVESTIGATION ☐ DESIGN INVESTIGATION ☐

NAME OF SCIENTIST*		GRADE	
NAME OF SCIENTIST		GRADE	
NAME OF SCIENTIST		GRADE	
NAME OF SCIENTIST		GRADE	

* If this project is awarded a monetary prize, the check will be written in this scientist's name, and it will be his/her responsibility to distribute the prize money equally among all participating scientists.

PROJECT TITLE

Purpose:

Procedure:

Conclusion:

1) Limit Abstract to 3 paragraphs (about 200 words or less). a) Purpose - what you set out to investigate; b) Procedure - how you did it; c) Conclusion - based on your results. Label each paragraph.
2) Must be typed, single-spaced on the front of this form. Do not write on the back of this form.
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SAFETY SHEET

The Illinois Junior Academy of Science

Directions: The student is asked to read these introductions carefully and fill out the bottom of this sheet. The science teacher and/or advisor must sign in the indicated space. By signing this sheet, the sponsor assumes all responsibilities related to this project.

Safety and the Student: Experimentation or design may involve an element of risk or injury to the student, test subjects and to others. Recognition of such hazards and provision for adequate control measures are joint responsibilities of the student and the sponsor. Some of the more common risks encountered in research are those of electrical shock, infection from pathogenic organisms, uncontrolled reactions of incompatible chemicals, eye injury from materials or procedures, and fire in apparatus or work area. Countering these hazards and others with suitable safety practices is an integral part of good scientific research. In the **chart** below, list the principal hazards associated with your project, if any, and what specific precautions you have used as safeguards. Be sure to read the entire section in the *Policy and Procedure Manual of the Illinois Junior Academy of Science* "Safety Guidelines for Experimentation" before completing this form.

Possible hazards	Precautions taken to deal with each hazard

Specific safety practices related to materials requiring endorsement sheets should be detailed on the specific endorsement sheet and not included on this safety sheet.

Please check off any other possible endorsements needed. Include these documents in your paper and on your board.

_____Humans as Test Subjects –for any projects involving humans including survey administration;

_____Microorganisms-for any projects involving bacteria, viruses, yeasts, fungi or protazoa;

_____Non-Human Vertebrates -for any projects involving fish, amphibians, reptiles, birds or mammals;

_____Tissue Culture-for any projects involving growing eukaryotic tissues or cell cultures;

_____Letter from institution where research was done or IJAS SRC, if an exception to the IJAS rules has been granted...

SIGNED

Student Exhibitor(s)

SIGNED

Sponsor *

*As a sponsor, I assume all responsibilities related to this project.

This Sheet Must Be Typed and This form **must** be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of paper 8.5 inches (vertical) X 5.5 inches (horizontal).

Humans as Test Subjects Endorsement

The Illinois Junior Academy of Science

These rules will be strictly enforced for the State Science Exposition.

No region should send a project to the State Exposition that does not meet these regulations.

Students and sponsors doing a human vertebrate project must complete this form. The signature of the student or students and the sponsor indicates that the project was done within these rules and regulations. Failure to comply with these rules will mean the disqualification of the project at the state level. This form must follow the Safety Sheet in the project paper.

1. Humans must not be subjected to treatments that are considered hazardous and/or that could result in undue stress, injury, or death to the subject.
2. **No** primary or secondary cultures taken directly (mouth, throat, skin, etc.) or indirectly (eating utensils, countertops, doorknobs, toilets, etc.) will be allowed. However, cultures obtained from reputable biological suppliers or research facilities are suitable for student use.
3. Quantities of food and non-alcoholic beverages are limited to normal serving amounts or less and must be consumed in a reasonable amount of time. Normal serving amounts must be substantiated with reliable documentation. This documentation must be attached to the Humans as Test Subjects Endorsement form. No project may use over-the-counter, prescription, illegal drugs, or alcohol in order to measure their effect on a person.
4. The only human blood that may be used is that which is either purchased or obtained from a blood bank, hospital, or laboratory. No blood may be drawn by any person or from any person specifically for a science project. This rule does not preclude a student making use of data collected from blood tests not made exclusively for a science project.
5. Projects that involve exercise and its effect on pulse, respiration rate, blood pressure, and so on are allowed provided the exercise is not carried to the extreme. Electrical stimulation is not permitted. A valid, normal physical examination must be on file for each test subject. Documentation of same must be attached to the Humans as Test Subjects Endorsement form.
6. Projects that involve learning, ESP, motivation, hearing, vision, and surveys require the **Humans as Test Subjects** form.

The signatures of the student or students and sponsor below indicate that the project conforms to the above rules of the Illinois Junior Academy of Science.

Fill out the following charts:

Were humans given food? If so, was it a serving size or less?	
Were humans subjected to exercise? If so, is there evidence of a physical on file for each test subject?	
Briefly describe how humans were used in the investigation.	

Describe the possible risks to humans test subjects.	Describe how each risk was handled or avoided.

Non-Human Vertebrate Endorsement
The Illinois Junior Academy of Science

These rules will be strictly enforced for the State Science Exposition.
No region should send a project to the State Exposition that does not meet these regulations.

Students and sponsors doing a non-human vertebrate project must complete this form. The signature of the student or students and the sponsor indicates that the project was done within these rules and regulations. Failure to comply with disqualification of the project at the state level. This form must follow the Safety Sheet in the project paper.

1. The student and the sponsor have the responsibility to see that all animals have proper care in well-ventilated, properly lighted locations with proper nutrition, proper temperature, adequate water, and sanitary surroundings. Care must be taken to see that the organisms are properly cared for during weekends and vacation periods.
2. **No** primary or secondary cultures involving warm-blooded animals taken directly (mouth, throat, skin, etc.) or indirectly (cage debris, droppings, etc.) will be allowed. However, cultures purchased from reputable biological supply houses or research facilities are suitable for student use.
3. No intrusive or pain- producing techniques may be used. Included in these techniques would be things such as surgery, injections, taking of blood, burning, electrical stimulation or giving of over-the-counter, prescription, illegal drugs, or alcohol to measure their effect.
4. No changes may be made in an organism's environment that could result in undue stress, an injury, or death to the animal.
5. No vertebrates can be used as the independent or dependent variables in an experiment that could result in undue stress, an injury, or death to the animal.
6. For maze running and other learning or conditioning activities, food or water cannot be withheld for more than 24 hours. If the animal has a high metabolic rate then food or water cannot be withheld for a length of time that would produce undue stress on the animal.
7. Chicken or other bird embryo projects are allowed, but the treatment must be discontinued at or before ninety-six hours from fertilization.
8. Projects that involve behavioral studies of newly hatched chickens or other birds will be allowed if no changes have been made in the normal incubation and hatching of the organism, and that all vertebrate rules are followed.

Fill out the following charts

Scientific and common name of animal(s) being used.	
Brief description of use of the organism(s).	

Describe the possible risks to the non-human vertebrates	Describe how each risk was handled or avoided

The **signatures** of the student or students and sponsor below indicate that the project conforms to the above rules of the Illinois Junior Academy of Science.

(Sponsor)*

(Student)

(Date) (Student)

*As a sponsor, I assume all responsibilities related to this project.

This Sheet Must Be Typed

This form MUST be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of paper 8.5 inches (vertical) X 5.5 inches (horizontal).

☐ **Check box if exception/approval letter from an institution where research was done, or the IJAS SRC is required and attached.**

Microorganism Endorsement

The Illinois Junior Academy of Science

These rules will be strictly enforced for the State Science Exposition.
No region should send a project to the State Exposition that does not meet these regulations.

Students and sponsors doing a microorganism project must complete this form. The signature of the student or students and the sponsor indicates that the project was done within these rules and regulations. Failure to comply with these rules will mean the disqualification of the project at the state level. This form must follow the Safety Sheet in the project paper and on the project board.

1. This area of science may involve many dangers and hazards while experimenting. It is the sole responsibility of all teacher(s)/sponsor(s) to teach students proper safety methods and sterile techniques.
2. The Illinois Junior Academy of Science prohibits the use of primary or secondary cultures taken from humans or other vertebrate animals in any project because of the danger from unknown viruses or other disease-causing agents that may be present. Pure cultures of microorganisms known to inhabit vertebrate animals may be obtained from reputable suppliers and used in proper settings.
3. Microorganism experiments must be conducted in a laboratory such as science classroom or research facility.
4. Projects involving viruses and recombinant DNA should be done with the help of a professional and should comply with the National Institutes of Health (NIH) Guidelines unless the project is limited to a kit obtained from a legitimate supply house.
5. All cultures should be destroyed by methods such as autoclaving or with a suitable NaOCl (bleach) solution before disposal.

Complete all boxes of the following chart.

Genus and species of organism(s) being used	
Name of the reputable source of the organism(being used.	
Method of disposal of the organism(s) being us	
List the location where t lab work was conducte	
Describe the use of microorganisms in this project.	
Other precautions take to ensure microorganisn are used safely in this investigation.	

The signatures of the student or students and sponsor below indicate that the project conforms to the above rules of the Illinois Junior Academy of Science.

(Sponsor)*

(Student)

(Date)

(Student)

*As a sponsor, I assume all responsibilities related to this project.

This Sheet Must Be Typed

This form **must** be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of paper 8.5 inches (vertical) X 5.5 inches (horizontal).

Check box if exception/approval letter from an institution where research was done, or the IJAS SRC is required and attached

☐

Tissue Culture Endorsement

The Illinois Junior Academy of Science

These rules will be strictly enforced for the State Science Exposition. No region should send a project to the state exposition that does not meet these regulations.

Students and sponsors doing a microorganism project must complete this form. The signature of the student or students and the spo indicates that the project was done within these rules and regulations. Failure to comply with these rules will mean the disqualifica of the project at the state level. This form must follow the Safety Sheet in the project paper.

1. This area of science may involve many dangers and hazards while experimenting. It is the sole responsibility of all teacher(s)/ sponsor(s) to teach students proper safety methods and sterile techniques.
2. The Illinois Junior Academy of Science prohibits the use of primary cell cultures taken from humans or other vertebrate animals any project because of the danger from unknown viruses or other disease-causing agents that may be present. Established tissue cu cell lines that are characterized as requiring biosafety level 1 (BSL1) procedures and precautions may be obtained from reputable suppliers and used in proper research settings. Cell lines requiring biosafety level 2 (BSL2) procedures and precautions for use mu have approval from IJAS prior to use OR be used in an established research facility.
3. Experiments using tissue culture cell lines must be conducted in a laboratory such as science classroom or research facility.
4. Projects involving tissue culture should be done with the help of a professional and should comply with the standards and princi for biological safety.
5. Experiments using tissue culture, including the culture of insect cells, with viruses and/or recombinant DNA must also follow th rules and regulations for these agents; one endorsement sheet detailing use of these agents together is acceptable.
6. All cultures should be destroyed by methods such as autoclaving or with a suitable NaOCl (bleach) solution before disposal.

Fill out all boxes in the chart below:

Published name of cells or tissue used	
Source from where the cells or tissues were obtained	
Cell disposal method used	
Brief description of how cells were used	
Safety precautions taken	

The **signatures** of the student or students and sponsor below indicate that the project conforms to the above rules of the Illinois Junior Academy of Science.

(Sponsor)*	(Student)
(Date)	(Student)

*As a sponsor, I assume all responsibilities related to this project.

This form MUST be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of paper
8.5 inches (vertical) X 5.5 inches (horizontal).

☐ **Check box if exception/approval letter from an institution where research was done, or the IJAS SRC is required and attached.**

STUDENT PROJECT AND SAFETY CHECKLIST

The Illinois Junior Academy of Science

Project Checklist

Abstract:
____First page of paper.
____3 paragraphs with proper headings: Purpose, Procedure, and Conclusion.
____Typed single-spaced.
____200 words or less.

Safety:
____Second page of paper.
____Hazards listed; precautions described.
____Signed by sponsor.

Humans as Test Subject or Non-Human Vertebrate Endorsement, if applicable:
____Third page of paper.
____Signed by student and sponsor; proper documentation is attached if necessary.

Title Page:
____Clear and concise.

Table of Contents:
____Pagination is accurate.

Acknowledgments:
____Credit is given to those who have helped.

Purpose and Hypothesis:
____States precisely what the investigation was attempting to discover.
____States a definite question or problem.
____Hypothesis is present.

Review of the Literature:

____Use of 3rd person is evident.
____Logical and/or related grouping of information.
____Accuracy in calculations, spelling, grammar, and quotations.
____Typed, double-spaced, one inch margins, single sided.
____Parenthetically cited.

Materials and Methods of Procedure:
____Apparatus and materials are listed.
____Drawings and photographs are present if they enhance and clarify the apparatus.
____Step-by-step, chronological procedures are present.
____Number of test groups is adequate and the number of trials within each test group is adequate.
____The control of variables is evident.

Results:
____Data is organized into tables or charts with accompanying graphs, if appropriate.
____Data is quantitative and correct units of measurement (metric) are used.
____Data is clear and accurate.
____The effect of experimental error was estimated and considered.

Conclusions:
____Evaluation and interpretation of data is present.
____Refers back to purpose and hypothesis; answers the original question.
____Is valid and limited to the results of the experiment.

Reference List:
____References come from a variety of sources.
____References are current.
____Reference list is alphabetical.
____Proper format is used for all references.

Experiment Safety:
____If experimenting with humans the following procedures were followed:
    ____No cultures were obtained from humans except those from supply houses.
    ____Quantities of food and non-alcoholic beverages were limited to normal serving sizes.
    ____Blood was not drawn exclusively for the science project.
    ____Projects involving exercise have a valid normal physical examination on file and exercise was not carried to the extreme.
____If experimenting with a non-human vertebrate the following procedures were followed:
    ____No cultures were obtained from warm-blooded animals.
    ____No intrusive techniques were used.
    ____No extreme changes were made in the organism's normal environment.
    ____Food or water was not withheld for a period that would cause undue stress. (based on the animal's metabolic rate)
    ____Animals were properly cared for with adequate ventilation, food, and water.
    ____Chicken or other bird embryo projects were terminated at or before 96 hours.

Exhibition Safety
____Project fits on a tabletop within 76 X 122cm limitations allowed; is no taller than 152 cm (5ft.)
____Glassware, if displayed, is stable and pushed far back from the front edge of the table.
____Chemicals that present any hazard at all are not displayed; colored water or photographs have been substituted.
____Crystals other than sucrose (sugar) and sodium chloride (salt) are not displayed. Projects involving

crystals have been represented by pictures or other three-dimensional models.

____Hazardous material: Explosive, flammable, corrosive, or poisonous materials, rockets, compressed or aerosol cans are not displayed.

____Fire hazards: No open flames, torches, or burners are displayed; electric hot plates are on non-combustible bases.

____Radiation: No laser, UV-light, x-rays, or other radioactive materials are displayed.

____Packing materials are not on or under the table.

____No living vertebrates are displayed.

____No hypodermic needles or syringes are displayed.

____No cultures of any kind are displayed.

____Electrical and/or mechanical equipment is (are) shielded, durable, enclosed, insulated, and quiet.