

Name:

Teacher:

Due:

Introduction

YES!!! It's that Science Project time of year. Just imagine the inquiry and organizational skills you'll learn and practice. Below is an extensive list of guidelines, explanations, and rules. Make sure you are clear about them. Share them with the people helping you at home. Ultimately, **YOU ARE RESPONSIBLE!**

1. You will do your own project. No partners.
2. Your project must be based on an experiment. You will follow the scientific method and collect **MEASURED DATA**. The project must include a data table with measurements and their units that can be graphed. If you want to build something, that's great, but you must test something about it that can be measured. (No written reports; no rock collections, terrariums, volcanoes...)
3. Follow the sheets included in this packet that will not only guide you through each step of the scientific method, but will also help you pull things together at the end like the bibliography, poster, and oral report (yes, you have to stand in front of people and talk). Get a cheap three-ring binder or folder to hold the packet in.
4. The sheets in this packet are **rough drafts** and are due along the way. There is a deadline checklist paper included in the beginning of this packet to keep track of what you have done.
5. Your project must have a control group and at least two experimental groups. Within each of these groups, there must be at least 15 trials. This means that at the very least you will repeat your procedure **45 times**. When you choose your project, keep in mind the cost of supplies and time available.
6. No animal projects. Leave your pets alone.
7. If you are going to use plants, plant 20 seeds per group in case some die. Keep in mind that we have a greenhouse in the science department you can use. Plant seeds by Monday, February 9 so they have time to grow. Do not start experimenting on the plants until they have all sprouted and have a set of leaves.
8. 80 projects will be chosen from the 8th and 9th grade for the Science Fair. The Science Fair will be held in May.
9. You may change your project idea up until the due date of the research sources. After that 20 points will be deducted from your final score if you change the project idea.
10. There will be time set aside in class every week or two for science fair help.
11. **Even if you are absent on the due date, your project is due. Late projects lose 10% per day.**

PROJECT DUE DATE:

Packet prepared by Stephanie Gill and Kelly Wester

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Topic Selection

This is one of the most difficult things about doing a science fair project. Keep in mind as you are picking a topic that you will have to live with it for about 10-12 weeks. Once you choose an idea that you like, spend a few quiet moments thinking about how the whole project would work. If you can imagine obstacles that will be too difficult, then find a new topic. Don't forget the cost of supplies and time constraints. If you change your topic after the deadline for the research sources, then you will lose 20 points off of your final score.

Sometimes the most interesting projects come from things that you like to do in your spare time. Think of your hobbies, sports, clubs, chores at home, etc. Is there some aspect of these that you could measure and test?

There are several science project books in the Science Department. The library has some as well. Remember that these books describe simple ideas, and you will probably have to expand on an idea from them to make it measurable and experimental.

In the space below, describe in one paragraph what you would like to do for a science project.

MY TOPIC:

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Problem Statement

The next step is to turn your topic into a problem statement for the project. The problem statement is a sentence or question that identifies the **independent variable** and the **dependent variable**.

Independent variable: the variable or factor that you decide to change; the cause

Dependent variable: the effect that you measure as a result of the independent variable

Example: How does the amount of water affect the height of plants?

Independent variable: amount of water

Dependent variable: height of plants

Notice in the example that both the independent and dependent variables are *measurable* in metric units.

Think about your topic and imagine a few possible independent and dependent variables that you could use. List them below.

Independent Variables

Dependent Variables

Now choose one from each list that will work well together and that you find most interesting. Write a problem statement including these as your independent and dependent variables for the project.

PROBLEM STATEMENT:

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Research Explanation

When you do research, you want to find articles and books that can teach you something about the independent and dependent variables of your project. Learn about the topic so that you can make a hypothesis in the next step based on intelligent information. Your conclusion will have to be related to what you learn about the variables now and how they turn out in your experiment. Therefore, the research is the foundation of a good hypothesis and a meaningful conclusion.

NO COMPLAINING ABOUT HOW HARD IT IS TO FIND SOURCES FOR YOUR TOPIC. Don't wait until the last minute. Take advantage of the librarians and interlibrary loan. Visit other libraries. This step is not hard, but it requires you to plan and be persistent.

YOU MUST HAVE AT LEAST 4 SOURCES:

- 1 BOOK
- 1 PERIODICAL (journal, newspaper, magazine)
- 1 BOOK OR PERIODICAL
- 1 OTHER (encyclopedia, Internet, interview with an expert in the field, book, periodical, etc.)

Come up with keywords for your research. Use your independent and dependent variables, any words or phrases related to them, or synonyms.

KEYWORDS:

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Source 1 - Book

Title:

Author(s):

Publishing company:

City where it was published:

Date of publication:

Page(s) you used:

Rewrite the information above in the correct bibliographic format. Use the examples on page 12 to help you.

Bibliography:

Two things learned from this source:

1.

2.

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Source 2 - Periodical

Title of periodical:

Title of article:

Author(s):

Volume number of periodical:

Date of periodical:

Page(s) of article:

Rewrite the information above in the correct bibliographic format. Use the examples on page 12 to help you.

Bibliography:

Two things learned from this source:

1.

2.

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Source 3 - Book or Periodical

Title of book/periodical:

Title of article:

Author(s)

Publishing company:

City of publication:

Volume of periodical:

Date of publication:

Page(s):

Rewrite the information above in the correct bibliographic format. Use the examples on page 12 to help you.

Bibliography:

Two things learned from this source:

1.

2.

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Source 4 - Your choice

If this source is a book or periodical, see the previous pages for the kind of information necessary. If it is an Internet source, obtain the information below:

Internet source

Title of article:

Author(s):

http:// address:

Date of document or date downloaded:

Rewrite the information above in the correct bibliographic format. Use the examples on page 12 to help you.

Bibliography:

Two things learned from this source:

1.

2.

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Extra Source(s)

If this source is a book or periodical, see the previous pages for the kind of information necessary. If it is an Internet source, obtain the information below:

Internet source

Title of article:

Author(s):

http:// address:

Date of document or date downloaded:

Rewrite the information above in the correct bibliographic format. Use the examples on page 12 to help you.

Bibliography:

Two things learned from this source:

1.

2.

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Bibliographic Format: Using APA Guidelines**Book with one author:**

Creswell, J.W. (1994). *Research design: Qualitative and quantitative approaches*. Newbury Park, CA: Sage.

Book with two or more authors:

Webb, W.H., Beals, A.R., & White, C.M. (1986). *Sources of information in the social sciences: A guide to the literature* (3rd ed.). Chicago: American Library Association.

Journal article, single author:

Van Maanen, J. (1981). The informant game: Selected aspects of ethnographic research in police organizations. *Urban Life*, 9(4), 469-494.

Chapter or article within an edited book:

Soltis, J.F. (1990). The ethics of qualitative research. In E.W. Eisner & A. Peshkin (Eds.), *Qualitative inquiry in education: The continuing debate* (pp. 247-257). New York: Teachers College Press.

Materials from the Internet:

Li, X. (1996, July 26). *Electronic Sources: APA Style of Citation*. [WWW document]. URL <http://www.uvm.edu/~xli/reference/apa.html>

Mestre, L. (n.d./1998). *Education Resources*. URL <http://www.library.umass.edu/subject/education/>

(Source: Evans, D.R., Rossman, G.B. (1998). *Using the work and words of other authors: A short guide to using APA guidelines*. Massachusetts: University of Massachusetts.)

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Parenthetical Documentation

When you write research papers of any type it will be necessary for you to use the ideas of others to support your own views. There are three different ways that you can use the ideas of other people:

1. Summarizing
2. Paraphrasing
3. Quoting directly

All of these examples require you to acknowledge that the ideas or words are not your own. Whenever you write something you must identify which ideas are not your own and indicate where they came from. People reading your paper must know when things you write are not your own thinking and how to find the original source if they need to find it. (Evans, 1998)

Summarizing:

When you summarize the major point, the general position, or an overall argument by an author, then a reference to the work as a whole without a page number is okay.

Paraphrasing:

A good way to use another author's words is to take their ideas and put them into your own words. In this way you can put emphasis on the parts that relate to what you are studying. You need to make sure that your paraphrase is accurate. (Evans, 1998)

Paraphrasing should be in your own words. You cannot paraphrase by taking sentences or phrases and just changing a few words - that is plagiarism. Paraphrasing works best if you read the whole section you wish to refer to several times until it is clear to you. (Evans, 1998, p. 2).

Quoting Directly:

Quoting directly is using the author's exact words. You should only do this if the author has a very exceptional way of stating something. A good thing to do is paraphrase most ideas and use one or two direct quotes to capture something an author said. Direct quotes should be in quotation marks unless the quote is longer than 3 lines, then it should be indented without quotes.

Parenthetical Documentation Cont'd

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Examples:

(Evans, 1998) - a summary - no page number necessary.

(Evans, 1998, p. 2-3) - a paraphrase - need the page numbers.

(Evans, 1998, p. 3) - a direct quote - need the page number.

(Source: Evans, D.R., Rossman, G.B. (1998). *Using the work and words of other authors: A short guide to using APA guidelines.* Massachusetts: University of Massachusetts.)

Plagiarism

The school policy on plagiarism is as follows:

PLAGIARISM: the reproduction or appropriation of someone else's work without proper attribution: passing off, as one's own the work of someone else. This includes but is not limited to books, magazines, papers, notes, print and Internet content. Cases of plagiarism are a serious breach of the standards of Marlborough High School and will be dealt with accordingly.

A parent/student sign-off found in the back of the "Guide for Better Writing" reviewing the definition of plagiarism and the consequences will be required on an annual basis.

The appeal process for alleged plagiarism is teacher, coordinator, assistant principal, principal, and then the superintendent.

For 6th, 7th, and 8th grades – writing is a learning process and, therefore, plagiarized work will receive a 0, with the possibility of earning a maximum grade of 60 by redoing the work with proper documentation.

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Research - Written Summary

After completing the research, you must summarize what you have learned about the independent and dependent variables in 2-3 paragraphs. Reread the notes you took. Organize the information in a logical way; don't just list in order what each source told you. Think of this as a mini-report about your variables.

Pay attention to grammar, spelling, and sentence structure. **Do not use the 1st person (I, we, my, etc.).** Use introductory and concluding sentences.

Since you are summarizing the work of other people, you must use parenthetical documentation to show where the ideas come from throughout your paragraphs (they should all be part of your sources!). Follow the guidelines for parenthetical documentation on pages 11-12.

Attach to this paper your written summary of your research.

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Hypothesis

After learning about the independent and dependent variables, you must make an educated guess about how the experiment will turn out. The hypothesis is one sentence that states what you think the answer to the problem statement will be based on what you learned in the research. The sentence should indicate what you expect the dependent variable (effect) to be as a result of changing the independent variable (cause).

The hypothesis should not be written in 1st person (I, we, my, etc.). Try using one of the formats below for writing your hypothesis, or adapt one of them so that you don't end up saying "My hypothesis is..."

1. It is hypothesized that there is a direct relationship between _____ and _____.
2. The hypothesis for this research project is that _____ will cause a significant change in _____.
3. It is hypothesized that _____ will result in _____.

WRITE YOUR HYPOTHESIS:

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Experiment - Materials

List all materials, supplies, equipment, tools, etc. that you will need for this project. Add or delete things from this list later when you perform the experiment so that the list you include in your final project is correct.

Typically, if you are using chemicals or plants, those things should be in a separate list next to the equipment.

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Experiment - Procedure

Write a list of all the steps you will need to follow to run the experiment. Another person should be able to follow your procedure without ever having to talk to you, so make it good. Although the procedure can be written as a numbered list or a paragraph, at this stage it is probably better to write it as a list so you can make changes as you go along for the final draft. You might want to set up the front and back of this page in two columns: one for the planned procedure and one for the actual procedure that you followed.

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Record and Analyze Data - Data Table

You must have a data table drawn before you experiment so that you have a place to record your observations neatly. It is difficult to draw one sample data table as an example, since yours will depend on the type of experiment you choose, but the one below may help you get started.

- Guidelines:
1. Label each data table with a number and title.
 2. Include a column for the control group and each experimental group.
 3. Each column should have a heading with units if appropriate.
 4. All 15 trials for each group should be shown.
 5. The average for the 15 trials in each group should be calculated.

Table 1: Growth of Marigolds (in cm) with Different Amounts of Water (in mL)

Control Group (25 mL of water)	Height of Plants (cm)	Experimental Group 1 (0 mL of water)	Height of Plants (cm)	Experimental Group 2 (50 mL of water)	Height of Plants (cm)
1		1		1	
2		2		2	
3		3		3	
...		
14		14		14	
15		15		15	
Average		Average		Average	

Sketch your data table on the next page and use it as a rough draft for your experiment.

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Record and Analyze Data - Data Table Cont'd

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Record and Analyze Data - Graph

Guidelines:

1. Use graph paper or a computer.
2. Decide whether a line graph or a bar graph is better for your data.
3. Label the top of the graph with a number and title that includes the dependent variable first and the independent variable second along with units of measurement
4. Label the x-axis with the independent variable and its units.
5. Label the y-axis with the dependent variable and its units.
6. Number the axes appropriately. Label the individual bars appropriately.

Sketch your graph here (or attach it) in order to have it checked before the final draft.

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Conclusion

The conclusion will be another mini-report that summarizes the experiment and relates it to the research and hypothesis. In addition, you need to think about how the experiment might be improved upon. Before writing a rough draft of your conclusion, fill in the information in each area below. These are the things that you will then organize and summarize in the conclusion.

1. What was the answer to the problem statement?
2. Was your hypothesis correct?
3. List data averages that will defend your answers to #1 and #2.
4. List at least 3 errors that might have happened and explain how they affected your results. (Do not include "I might have written down the wrong number," or "I might have calculated wrong.")

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Conclusion Cont'd

5. What could be done differently if you repeated this experiment (either to minimize errors or help clarify your results)?

6. What is the importance of this experiment? What impact could the results have?

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Conclusion Cont'd

Use the answers for the questions on the two previous pages to write your conclusion. A good format might be to write one paragraph about questions 1, 2, and 3, a second paragraph about questions 4 and 5, and a third paragraph about question 6.

Use correct grammar, spelling and sentence structure. Write good introductory and concluding sentences. **Do not use the 1st person.**

Write your rough draft here or attach it.

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Bibliography

Write all of your sources in the correct bibliographic format in alphabetical order by author.

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Poster Design

_____ Find and organize all of the information and materials for the project.

_____ Neatly recopy (using a computer) each of the written parts of the scientific method onto its own sheet of paper. Use large, clear lettering that can be read by people as they pass by your project.

_____ Get a piece of display board to attach your papers and pictures to.

_____ Write a title at the top of the board. Write your name near your title.

_____ Before you attach anything, arrange the papers of your experiment on the display board to see how they look. They should be in order of the scientific method. Once you are satisfied, attach them neatly to the board. Feel free to have a colorful background. Use some creativity. Your poster should be eye-catching.

_____ Set up other equipment in front of your poster to see how it looks.

_____ Make a sketch of your poster to turn in.

Example:

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Oral Report Guidelines

_____ Prepare for your presentation by reviewing each part of the experiment so that you know it well. Review your research so that you can speak intelligently about your topic.

_____ Think about the following questions:

What were your results?

Why did you choose this project?

What was the hardest part (or easiest)?

What were the one or two things you learned?

What would you do differently next time? Why?

_____ Use note cards for your presentation. Do not read from your poster.

_____ Practice your presentation before you actually present.

_____ Prepare a 2 - 4 minute introduction of your project.

_____ Speak slowly, and do not chew gum. Take a deep breath if you get confused.

_____ Explain how you tested your hypothesis.

_____ Review your major findings.

_____ Discuss your conclusions.

_____ Prepare a 1-2 minute conclusion to your presentation.

_____ Ask if there are any questions.