Science Fair Experiment Guide

Sixth Grade

I have read the Science Fair Experiment Guide in its entirety.

Student signature: _____

Parent signature: _____

Dear Students and Parents,

It's time for sixth grade students to begin working on their Science Fair Projects. This year's Fair will be held in December**.** All sixth grade students are required to complete a project. Since this is a major project, it will be scored as a test grade for the next grading period.

Attached is your child's Science Fair Project Handbook. This Handbook provides guidelines and ideas on how to create an effective project. Included is a list of deadline dates that must be met in order to ensure that all requirements are completed on time. Ample time has been scheduled and work has been spread out, so students can complete the work at a comfortable pace.

You are invited to work along with your child as he/she selects, investigates, and reports on an area of science. With your interest and encouragement, your child can develop the skills and attitude necessary to make this project a valuable experience for them. Guide your child whenever and wherever you can, but let the final project reflect your child's individual effort and design.

We are looking forward to working with you to make this a valuable learning experience for your child. Your child will succeed by learning and understanding more about science and how scientists work. The real goal is to stimulate your child's curiosity about the world.

As we progress through the next couple months, please feel free to contact us if you have any questions or concerns.

Sincerely,

Mrs. Rothert

Mrs. Miller

Fleming Island Elementary

6th Grade Science Teachers

Table of Contents

DATES TO REMEMBER

Item Due	Due Date
Topic Selection worksheet	September 13
Research/Bibliography pages	September 27
Hypothesis/Variable worksheet	October 11
Procedures/Materials typed page	October 17
Experimenting begins	October 25
Final Project	December 6
School Science Fair Judging	December 13
Open House	December 16

Science Fair Project
Student Checklist

Name _____
Class _____

Data Notebook: (worth 20 points total)

1. Title (1pts) _____
2. Problem & Hypothesis (2 pts) _____
3. Materials (4 pts) _____
4. Procedures (4 pts) _____
5. Data Collected (9 pts) _____

Total Points:_____

Project Notebook: (worth 40 points total)

1. Title Page (2 pts) _____
2. Abstract (5 pts) _____
3. Table of Contents (2 pts) _____
4. Problem (1 pts) _____
5. Research Paper (5 pts) _____
6. Hypothesis (2 pts) _____
7. Variables (2 pts) _____
8. Materials (2 pts) _____
9. Procedures (4 pts) _____
10. Data/Graphs (5 pts) _____
11. Conclusion (4 pts) _____
12. Bibliography (5 pts) _____
13. Acknowledgements (1 pts) _____

Total Points:_____

Display Board: (worth 40 points total)

1. Title (3 pts) _____
2. Problem (2 pts) _____
3. Research (3 pts) _____
4. Hypothesis (2 pts) _____
5. Procedures (4 pts) _____
6. Data/Graphs (5 pts) _____
7. Conclusion (4 pts) _____
8. Abstract (5 pts) _____
9. Pictures (5 pts) _____
10. Creativity/Neatness (7pts) _____

Total Points:_____

Science Fair Experiment Grade: _____

Science Vocabulary

Abstract - Short (200-250 words) summary of the entire project. It should summarize the purpose, procedure, and results. There will be a specific format.

Conclusion - Written Summary of findings. Evaluate accuracy of hypothesis. Determine any extraneous variables. Note future changes. List applications and benefits to real-life situations.

Data/Results - Observations of everything that happens during the experiment. Use metric measurements. Repetition (repeated trial) provides convincing results. Final results are displayed in the form of tables, graphs, and photographs.

Hypothesis - An educated guess presuming the outcome of the experiment. Follows background research and definition of the problem.

Materials - A detailed list of all items used in the course of the experiment. Exact amounts and/or units of these items must be listed.

Problem - The specific problem that is going to be investigated. State this in the form of a question.

Procedure - Step-by-step instructions describing the entire experiment. Steps should be explained so that another person could duplicate the experiment. Any changes must be added as an addendum to the procedure.

Variables - These are the factors that have an effect on your experiment.

a. Independent- the one factor that is changed
b. Dependent – the factors that will be measured
c. Control- factors that are kept the same

Background Research

Where do I look?

Your research will most likely begin in the library. But where do you begin in the library?

1. Start first with a general encyclopedia like World Book Encyclopedia, Brittanica or The New Book of Knowledge. You need lots of background information. Use key words from problem. Check the index. Read and take notes.
2. Check the scientific encyclopedias such as The New Book of Popular Science. Read and take notes.
3. Check on the computer for books related to your topic or key words.
4. Check your textbook or other science textbooks. Use the index or table of contents.
5. Look in magazines for articles. These are especially good because they may contain recent articles.
6. Talk to experts. Interviews are a good source of information. Have planned questions before you talk to anyone. Listen and take notes.
7. Check the internet. PLEASE NOTE: Information taken from the internet must be from a recognized source.

Find out everything you can. If possible, write or call agencies for information. Be resourceful and be thorough. You will have to search out the information you need. Many times you will read references that will not provide the information for which you are looking. Remember, you are collecting information relevant to your problem. You need background information about your problem, information about your experiment, and information about the expected outcome.

After you have found your 5 sources and recorded the information in the bibliography section, you are ready to read and take notes. It is perfectly normal not to know what information to take down as notes. It's better to take too much information than to have to come back later. Information will be recorded on bottom of source pages.

1. Don't copy information. Use ideas, facts, and phrases. If you do have to copy word from word, put quotation marks around it and use only when absolutely necessary.
2. No information should be used in your paper which is not on a written on your source pages unless it is your opinion.
3. You must give credit to your references for all information used unless it is your opinion.

Background Research Report Tips

The report is not to be an abstract that is on your display board but background research tied to your topic. If you have a title such as The Effects of Light on Lima Bean Plants, you would research photosynthesis and/or beans.

A. Do not use personal pronouns such as "I" or "me."
B. Must be typed with double spacing.
C. Needs to be 1-2 pages long.
D. Use Times New Roman font with a size of 14.
E. Use metric units for all measurements.
F. Must be in complete sentences and in **your own words.**
G. Opening paragraph: draws attention to your topic and gives the reader an idea of what your paper is about.
H. Body paragraphs: details about different parts of research. At least 3 paragraphs but may be more depending on your topic.
I. Conclusion paragraph: summary of everything talked about in the body of the paper.
J. References (on bibliography page)- must have a minimum of 5 sources with no more than 3 from the internet. Also, include this reference in your sources (on bibliography page) as per county guidelines: http://www.societyforscience.org/isef/ because this is where the rules for your project come from.

Phase 2

Finding Information for Your Research Paper

You are required to site at least **5 sources** of information for your Research Paper. On each of the following pages, you are to first **cite the source** you are using. In the space below your citation, you are to **write key facts and ideas** you learned from that source. Remember to **use your own words** when summarizing information to avoid plagiarism.

DO NOT CITE GOOGLE.COM OR WIKIPEDIA! USE RELIABLE SOURCES!

Use this first page as a practice page with your teacher

Note: You won't fill in every item depending on the type of source.

Practice

<table>
<tr><td colspan="3">This source is a: _____ Book _____ Magazine _____ Newspaper _____Website _____ Other_____</td></tr>
<tr><td colspan="3">Author's Last Name_____ First Name _____ Middle Initial _____</td></tr>
<tr><td>Date Published _____</td><td colspan="2">Title of Publication
or Website _____</td></tr>
<tr><td colspan="3">Title of Article
(periodicals, encyclopedias, websites)_____</td></tr>
<tr><td>Place Published
(books only)_____</td><td>Publisher
(books only)_____</td><td>Editor
(if applicable)_____</td></tr>
<tr><td>Edition
(if applicable)_____</td><td>Volume Number
(periodicals or encyclopedias)_____</td><td>Page Number(s)_____</td></tr>
<tr><td colspan="3">Website is a __ Company __ Organization __ Government __ Newspaper/Magazine __ Other_____</td></tr>
<tr><td colspan="2">The URL is http://
(websites only) _____</td><td>Last date of access
(websites only)_____</td></tr>
</table>

Main Ideas and Important Facts

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Phase 2

Source 1

This source is a: _____ Book _____ Magazine _____ Newspaper _____Website _____ Other_____		
Author's Last Name_____ First Name _____ Middle Initial _____		
Date Published _____	Title of Publication or Website _____	
Title of Article (periodicals, encyclopedias, websites)_____		
Place Published (books only)_____	Publisher (books only)_____	Editor (if applicable)_____
Edition (if applicable)_____	Volume Number (periodicals or encyclopedias)_____	Page Number(s)_____
Website is a __ Company __ Organization __ Government __ Newspaper/Magazine __ Other_____		
The URL is http:// (websites only) _____		Last date of access (websites only)_____

Main Ideas and Important Facts

Phase 2

Source 2

This source is a: _____ Book _____ Magazine _____ Newspaper _____Website _____ Other_____		
Author's Last Name_____ First Name _____ Middle Initial _____		
Date Published _____	Title of Publication or Website _____	
Title of Article (periodicals, encyclopedias, websites)_____		
Place Published (books only)_____	Publisher (books only)_____	Editor (if applicable)_____
Edition (if applicable)_____	Volume Number (periodicals or encyclopedias)_____	Page Number(s)_____
Website is a __ Company __ Organization __ Government __ Newspaper/Magazine __ Other_____		
The URL is http:// (websites only) _____		Last date of access (websites only)_____

Main Ideas and Important Facts

Phase 2

Source 3

This source is a: _____ Book _____ Magazine _____ Newspaper _____Website _____ Other_____		
Author's Last Name_____ First Name _____ Middle Initial _____		
Date Published _____	Title of Publication or Website _____	
Title of Article (periodicals, encyclopedias, websites)_____		
Place Published (books only)_____	Publisher (books only)_____	Editor (if applicable)_____
Edition (if applicable)_____	Volume Number (periodicals or encyclopedias)_____	Page Number(s)_____
Website is a __ Company __ Organization __ Government __ Newspaper/Magazine __ Other_____		
The URL is http:// (websites only) _____		Last date of access (websites only)_____

Main Ideas and Important Facts

Phase 2

Source 4

This source is a: _____ Book _____ Magazine _____ Newspaper _____Website _____ Other_____		
Author's Last Name_____ First Name _____ Middle Initial _____		
Date Published _____	Title of Publication or Website _____	
Title of Article (periodicals, encyclopedias, websites)_____		
Place Published (books only)_____	Publisher (books only)_____	Editor (if applicable)_____
Edition (if applicable)_____	Volume Number (periodicals or encyclopedias)_____	Page Number(s)_____
Website is a __ Company __ Organization __ Government __ Newspaper/Magazine __ Other_____		
The URL is http:// (websites only) _____		Last date of access (websites only)_____

Main Ideas and Important Facts

Phase 2

Source 5

This source is a: _____ Book _____ Magazine _____ Newspaper _____Website _____ Other_____		
Author's Last Name_____ First Name _____ Middle Initial _____		
Date Published _____	Title of Publication or Website _____	
Title of Article (periodicals, encyclopedias, websites)_____		
Place Published (books only)_____	Publisher (books only)_____	Editor (if applicable)_____
Edition (if applicable)_____	Volume Number (periodicals or encyclopedias)_____	Page Number(s)_____
Website is a __ Company __ Organization __ Government __ Newspaper/Magazine __ Other_____		
The URL is http:// (websites only) _____		Last date of access (websites only)_____

Main Ideas and Important Facts

Sample Bibliography: MLA Works Cited Format

"Battery." *Encyclopedia Britannica*. 1990.

"Best Batteries." *Consumer Reports Magazine* 32 Dec. 1994: 71-72.

Booth, Steven A. "High-Drain Alkaline AA-Batteries." *Popular Electronics* 62 Jan. 1999: 58.

Brain, Marshall. "How Batteries Work." *howstuffworks*. 1 Aug. 2006 <http://home.howstuffworks.com/battery.htm>.

"Cells and Batteries." *The DK Science Encyclopedia*. 1993.

Dell, R. M., and D. A. J. Rand. *Understanding Batteries*. Cambridge, UK: The Royal Society of Chemistry, 2001.

"Learning Center." *Energizer*. Eveready Battery Company, Inc. 1 Aug. 2006 <http://www.energizer.com/learning/default.asp>.

"Learning Centre." *Duracell*. The Gillette Company. 31 July 2006 <http://www.duracell.com/au/main/pages/learning-centre-what-is-a-battery.asp>.

http://www.sciencebuddies.org/science-fair-projects/project_mla_works_cited_examples.shtml

Data Notebook

Your data notebook is a record of progress and events throughout your investigations. It is very much like a diary. A spiral bound notebook or a composition book are generally used for this purpose. The data notebook is a workbook and should not be typed! Good notes show consistency and thoroughness to the judges and will help you write your project paper. The better the records you keep, the better your project will be. The data notebook is to be displayed as part of your exhibit. Each time you do any type of work on your project (collect data, make observations, add research, etc), you should add it to your data notebook.

Use the following format to organize your data. If you have any questions, please consult your science teacher.

Write the title of your experiment on the first page of your notebook.

On the second page, write the problem and hypothesis of your experiment.

On the third page, list your materials you are using.

On the fourth page, write step by step, a detailed list of how to conduct your experiment. This is your procedures. These may be adjusted as needed.

Finally, it will be time to begin. **Write the date in the upper right-hand corner of the page each time you begin a new entry**. Describe everything you do relating to your project from the time you begin until you are finished. **Write very clear, detailed observations and record any problems you encounter along the way.** Remember to record any physical changes through measurements (**METRIC ONLY**) or through observations.

Hypothesis

Key Info

- A hypothesis is an educated guess about how things work.
- Most of the time a hypothesis is written like this: "If _____[I do this] _____, then _____[this]_____ will happen." (Fill in the blanks with the appropriate information from your own experiment.)
- Your hypothesis should be something that you can actually test, what's called a **testable** hypothesis. In other words, you need to be able to measure both "what you do" and "what will happen."

Hypothesis

After having thoroughly researched your question, you should have some educated guess about how things work. This educated guess about the answer to your question is called the hypothesis.

The hypothesis must be worded so that it can be tested in your experiment. Do this by expressing the hypothesis using your independent variable (the variable you change during your experiment) and your dependent variable (the variable you observe-changes in the dependent variable depend on changes in the independent variable). In fact, many hypotheses are stated exactly like this: "If a particular independent variable is changed, then there is also a change in a certain dependent variable."

Example Hypotheses

- "If I open the faucet [faucet opening size is the independent variable], then it will increase the flow of water [flow of water is the dependent variable].
- "Raising the temperature of a cup of water [temperature is the independent variable] will increase the amount of sugar that dissolves [the amount of sugar is the dependent variable]."
- "If a plant receives fertilizer [having fertilizer is the independent variable], then it will grow to be bigger than a plant that does not receive fertilizer [plant size is the dependent variable]."
- "If I put fenders on a bicycle [having fenders is the independent variable], then they will keep the rider dry when riding through puddles [the dependent variable is how much water splashes on the rider]."

Note: When you write your own hypothesis you can leave out the part in the above examples that is in brackets [ ].

Notice that in each of the examples it will be easy to measure the independent variables. This is another important characteristic of a good hypothesis. If we can readily measure the variables in the hypothesis, then we say that the hypothesis is **testable**.

Not every question can be answered by the scientific method. The hypothesis is the key. If you can state your question as a testable hypothesis, then you can use the scientific method to obtain an answer

http://www.sciencebuddies.org/science-fair-projects/project_hypothesis.shtml

Phase 1
Identify Variables

1. Identify all of the variables in your experiment that need to be **controlled** or stay **constant**.

   _____ _____ _____

   _____ _____ _____

   _____ _____ _____

2. What is the **independent variable** in your experiment? (What are you going to test?)

   _____

   _____

3. How are you going to **manipulate** this variable? (What will you be changing about it?)

   _____

   _____

4. What is the **dependent variable** in your experiment? (What will change as a result of your experiment?)

   _____

   _____

5. What tools do you need to use to **measure** your dependent variable? (stop watch, meter stick, thermometer, etc.) What **units** will you be using? (meters, liters, grams, etc.)

   _____

   _____

Form your Hypothesis

Write an If – then statement in the space below, thinking about the variables you identified. For example: If I do this (state your independent variable), then this will happen (state how your dependent variable will change).

If _____,

then _____.

Materials and Experimental Procedure Page

This page must be typed and handed in prior to beginning your experiment.

MATERIALS LIST

The materials section is a list of everything you used while running the experiment including chemicals, equipment, measurement devices, safety equipment, etc.

EXPERIMENTAL PROCEDURE

The procedure section is a step by step description of how to perform the experiment. Explain all of the following that will apply to your project: how you will keep the controlled conditions the same, what device you will use to measure the data with and in what units (must be metric), how you will measure the data using the device, when to measure the data, when to record the data, how many trials to repeat and all safety precautions.

www.sciencebuddies.org

Sample Materials List & Experimental Procedure

Materials List

- CD player & a CD (low drain device)
- Three identical flashlights (medium drain device)
- Camera flash (high drain device)
- AA size Duracell and Energizer batteries
- AA size of a "heavy-duty" (non-alkaline) battery (I used Panasonic)
- Voltmeter & a AA battery holder
- Kitchen timer

Experimental Procedure

1. Number each battery so you can tell them apart.
2. Measure each battery's voltage by using the voltmeter.
3. Put the same battery into one of the devices and turn it on.
4. Let the device run for thirty minutes before measuring its voltage again. (Record the voltage in a table every time it is measured.)
5. Repeat #4 until the battery is at 0.9 volts or until the device stops.
6. Do steps 1–5 again, three trials for each brand of battery in each experimental group.
7. For the camera flash push the flash button every 30 seconds and measure the voltage every 5 minutes.
8. For the flashlights rotate each battery brand so each one has a turn in each flashlight.
9. For the CD player repeat the same song at the same volume throughout the tests.

http://www.sciencebuddies.org/science-fair-projects/project_sample_materials_procedure.shtml

Experiment Data

- You must repeat your experiment with each experimental group in at least 3 separate trials. This is so your data will be reliable. The more trials you conduct, the more likely that someone else repeating your experiment will get the same results.
- If you're experimenting with plants, make sure you have plenty of time to measure growth/changes. Four to six weeks is recommended.
- Make sure you have a control and/or controlled conditions in your experiment to compare the results of what you're testing.
- Make sure you measure as carefully as you can and use the most precise(smallest) units possible. This makes your measurement data more accurate. **Must use metric units!**
- Set up your data table. Remember to have a title and label the variable and what measurements you used.
- Systematically record all data in your data notebook. Data should include numerical measurements, personal observations, photographs, drawings, etc. The date of all observations must also be recorded.

Graphs

- Make at least one graph of your data. Graphs may be circle, line, or bar graphs.
- Bar graphs are appropriate when the variable is not numerical and is used to show comparisons.
- Circle graphs are also used to show comparisons but are used when it's appropriate to show percentages.
- Line graphs show change and are generally used when the variable IS numerical.
- For assistance with graphing, the following website is helpful: http://nces.ed.gov/nceskids/createagraph/default.aspx

RESULTS

The Results section of your Research Report should include all of your data neatly compiled in tables and/or figures. Remember that each table or figure should be numbered, titled, and clearly labeled. It is often a good idea to follow each table and figure with a descriptive paragraph. Some examples of tables and figures are given below.

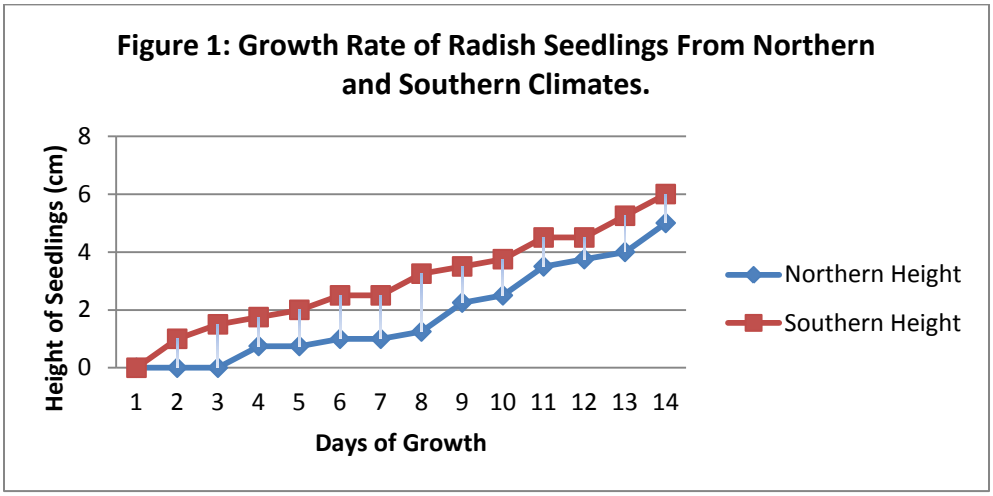
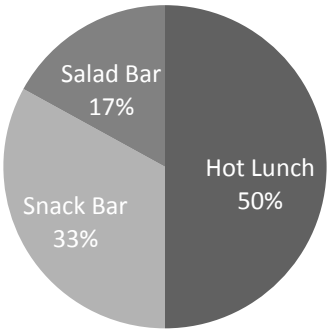


Table 2: Number of Insects Found at the Glenridge Track Field During Varying Times

	Roaches	Grasshoppers	Lady Bugs	Bees
6:00 AM	0	1	0	0
8:00 AM	0	0	1	0
10:00 AM	0	5	15	2
12:00 PM	0	2	13	10
2:00 PM	20	4	3	8
4:00 PM	3	16	0	2

Figure 3: Percentages of Students Using Various Cafeteria Lunch Lines



Project Notebook Guidelines

The project notebook is a typed, "formal" report in which you go into detail about your project and organize your data. The project notebook will contain the following elements in the **following order:**

1. Title Page
2. Abstract
3. Table of Contents
4. Problem
5. Background Research Paper
6. Hypothesis
7. Variables- Independent and dependent
8. Materials
9. Procedures
10. Data: (include graphs, data tables, and observations)
11. Conclusions
12. Bibliography
13. Acknowledgements

Failure to put **ALL** research in one's own words will result in the student receiving no credit for the background research paper. Plagiarism will not be tolerated. This includes "cut and paste." Also, failure to include all elements of the project in the order stated above will result in points being deducted from your project's grade.

Project Notebook (each section is a separate page)

1. Title Page – The title is either an original title or your problem statement. This page should also have your name and period number on it in the bottom right hand corner.
2. Abstract – The purpose of the abstract is to provide a 200-250 word summary of your project. See example in packet.
3. Table of Contents – This page must include the appropriate sections with their correct page numbers. Page numbers should be on the right hand side.
4. Problem – The problem is the specific question that you are trying to answer. It should be stated in the form of a question. *Example: Do bean plants grow taller with Acme or Generic brand fertilizer?*
5. Background Research Paper – This section should provide complete and thorough background information. This is where you use information from your source pages. Include in this section all information which would be important to know in order to understand the topic and the experiment. Must be at least one page long, double spaced. (see tip page) **Research must be in the student's own words!!**
6. Hypothesis – This must be well-written and testable. It is the student's educated guess to answer the problem.
7. Variables- a list of your independent and dependent variables.
8. Materials – the complete list of all materials used.
9. Procedures- numbered, step by step, detailed, and complete.
10. Data – a summary of observations, examples of graphs, data tables.
11. Conclusion – At this time, a conclusion must be reached. The technique of drawing conclusions from a set of data is rarely obvious as it may seem at first. No matter how carefully the conditions are controlled, variations might occur and lead to errors in the conclusion. Be sure to state whatever variations occurred that you weren't expecting. When you state your conclusion, ensure you answer whether or not your hypothesis was correct!
12. Bibliography- Remember, you should have a minimum of 5 references listed. Not all can be from websites. Refer to the bibliography page for more information on how to write one.
13. Acknowledgements – On this page, identify those individuals who assisted with the project. Each person should be listed with their name and a specific comment about the type of assistance provided.

ABSTRACT EXAMPLE

Brand of Fertilizer vs. Height of Bean Plants

The purpose of my project was to answer the question, "Do bean plants grow taller with ACME or Generic brand fertilizer?" I predicted that bean plants given ACME fertilizer will grow taller than bean plants given Generic brand fertilizer. I tested each brand of fertilizer on a group of 5 bean plants. I also tested a control group of 5 bean plants that received no fertilizer. The amount of fertilizer, amount of sunlight, amount of water, type of soil, temperature, type of plant and starting size of plants were all kept the same for all 15 plants. The only factor that was changed on purpose was the type of fertilizer. The height of each plant was measured in centimeters using a ruler and recorded every other day for 28 days. My results showed that on average the ACME group grew the tallest at 26cm, while the Generic group grew 23cm and the control group only 20cm. My conclusion was that I had correctly predicted that ACME fertilizer would make the plants grow the tallest. The ACME group grew an average of 3cm taller than the Generic and an average of 6cm taller than the control group.

Display Board

The following items are required to be on your display board:

Items 2-8 below should have a larger font for the title, and a smaller font for the text for each item.

1. **Title** : Make it unique and catchy.
2. **Research Paper**: Please attach in such a way that all pages can be read.
3. **Problem**
4. **Hypothesis**
5. **Procedures**
6. **Data**: Graphs and charts summarizing data collected during the experiment.
7. **Conclusion**: This is a summarized paragraph explaining why you think you got the results that you did, and what if any changes you would make next time.
8. **Abstract**: This is an overall summary (200-250 words) about your project. It should explain what you were trying to do, what actually happened, and what findings you got.
9. **Photographs**: Labeled and mounted – **no faces showing in photos.**

Project Notebook: This should be found on the table in front of your display. This is a typed report of the entire project. It will include more information than what is on the board. (see page in guide on how to do this)

Data Notebook: The data notebook is also found on the table in front of your display board. It should be written in your handwriting. (see page in guide on how to do this)

Display Board

Problem

Hypothesis

Abstract

Title

Research

Data & Graphs

Procedure

Conculsion

Pictures

Project Notebook

Data Notebook

*** A Materials List is optional to post