# 2014-2015 Middle School 7th Grade Science Project

## Introduction to the Project

People use the Scientific Method every day, and they don't even realize it! Science is everywhere – in things seen and unseen!

***The due date for the project is March 13th, 2015***. You will turn in your project via kmail to your Homeroom Teacher. ***Class Connect support for the project will be given in November when the Scientific Method will be taught in detail by your science teacher!***

## Final Product: Website or PowerPoint AND Written Conclusion Report

Websites can be created for free at www.weebly.com or www.prezi.com. If you would like to do a PowerPoint and you DO NOT have Microsoft Office, here are two free download programs you can use to create PowerPoints and Word Documents: Open Office Suite OR Kingsoft Suite Free Downloads.

Your PowerPoint or Website should include the following:

1. Abstract
2. Question
3. Background Research
4. Hypothesis
5. Experimental Design
    a. State your variables
    b. List your materials
    c. List your procedure
    d. State your observations
    e. Display your Data in pictures, charts, graphs, and/or tables
6. Conclusion
    a. Did your experiment support or reject your hypothesis? (include a statement on your PowerPoint/Website)
    b. Write your conclusion report in a Word Document (use one of the above free downloads if you do not have Microsoft Word on your computer)
7. Resources and Bibliography

## The Scientific Method

What is it? The Scientific Method is set of organized steps used to solve problems and/or answer questions about the world around us!

The Steps include:

1. Asking a question
2. Conducting Background Research
3. Formulating a Hypothesis
4. Testing the Hypothesis with an Experiment
5. Analyzing Data and Drawing Conclusions
6. Communicating Results

(For more information on the Scientific Method, visit the Science Buddies website!)

## The Task

You will use the Scientific Method to compose a science project from start to finish! After submitting your project for a grade to your homeroom teacher, your final project will be evaluated, and if chosen, will be entered into our 4th Annual GCA Science Fair! (More details to come later about this if your project is chosen!) Although the Virtual Fair is not part of the project and you don't have to attend, it is great fun and a great way to show off your hard work! You may also enter your finished project into the Face to Face Science Fair Outing at the Tellus Museum whether or not your project is chosen for the Virtual Fair! Usually this outing is in May, and is completely optional.

## How-to Guide

Follow the steps below sequentially to complete your project!

**Create a Logbook**: All scientists keep a record of their experiments in some form of a journal. EVERYTHING that goes on with your experiment should be written down in a logbook. The logbook is bound (either a spiral notebook or a composition notebook). Entries must be written clearly and with detailed description so that another scientist can read it, duplicate the conditions of the experiment, and repeat the experiment exactly.

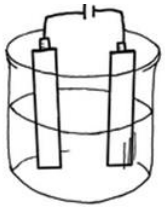
### Before an Experiment

**Ask a Question**: The research question is the single most important part of the scientific method. Every part of your project is done to answer this question. Write your question down in your logbook.

**Research Your Topic**: What do you already know about your topic (prior knowledge)? Write it down in your logbook. Read books about your topic, hunt the internet, and find out what has been discovered about your topic already. Write your research down in your logbook. Don't forget to cite your sources.

**Hypothesis**: The hypothesis is an "educated guess" of what you ***think*** the answer to your question is ***based on your research***. A hypothesis is formed as an "**If, then, because**" statement, that you propose to be the answer to the research question. An educated guess is based on some prior knowledge and the research you have done.
**Example of a hypothesis written in the correct format**: **If** I use the most expensive fertilizer, **then** plants will grow taller **because** there are more nutrients in more expensive fertilizers.

### During an Experiment



**Experimental Design**: Plan an experiment in which you can test your hypothesis. You should have at least 3 trials to your experiment.

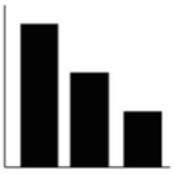
- **Variables**: The experiment will have parts that are manipulated (changed) and parts that occur as a result of that manipulation. An element or elements that do not change are called controlled variables or dependent variables, and elements that will change are called manipulated variables or independent variables.

- **Materials**: List **all** supplies and equipment used during your experiment in your logbook.
  Example:
  250 ml. glass beaker
  1 straw
  150 ml. Lime Water
  10 g. Baking Soda

- **Procedure**: The procedure is a ***detailed, step-by-step description of how you conducted your experiment***. Example: "After 1 minute, I stirred in the baking soda and timed the reaction to be 45 seconds." Think about the procedure as a list of directions! The procedure should be written so that someone can take the procedure and duplicate your experiment step by step! You should write out your procedure AS YOU ARE DOING YOUR EXPERIMENT so you don't forget any steps.

- **Observation**: When you interact with your experiment, you are using your senses to observe. Does it have a smell, make a noise, have color, etc.? List any observations during your experiment in your logbook.

- **Collect Data**: As you observe your experiment, you will need to record the progress of your experiment. Data can be whatever you observe about your experiment that may or may not change during the time of the experimentation. Examples of data are values in pH, temperature, a measurement of growth, color, distance, etc. Data can be qualitative (color, appearance, shape, etc) or quantitative (precise measurements, numbers, etc.).



- **Data**: The data are the values written down as the experiment progresses. Examples of data entry on measuring plant growth. Notice there are 3 test plants to have 3 trials:

  11/15/04 Control Plant 7.4 mm
  Test Plant 1 16.2 mm
  Test Plant 2 24.9 mm
  Test Plant 3 37.2 mm

  11/22/04 Control Plant 7.8 mm
  Test Plant 1 15.9 mm
  Test Plant 2 23.2 mm
  Test Plant 3 37.2 mm

- **Pictures, Charts & Graphs**: When at all possible, illustrations of data are advisable. They create a professional appearance and convey a great deal of information. Examples include: Bar Graph, Pie Chart, X & Y axis Graph, Histogram, etc. Charts and graphs make data easier to understand. It is also advisable to have pictures of you actually performing your experiment. Ask your Learning Coach or a friend to take pictures while you are doing your experiment.

**After an Experiment**

**Analyze your Data:** Look carefully at your data for patterns.

**Write an Abstract**: An ***abstract*** is an abbreviated version of your science project final report. For most science projects, it is limited to a maximum of 250 words. **You will write this AFTER your experiment is complete!**

Almost all scientists and engineers agree that an **abstract should have the following five pieces**, so make sure yours does! :

1. **Introduction**. This is where you describe the purpose for doing your science project or invention. Why should anyone care about the work you did? You have to tell them why. Did you explain something that should cause people to change the way they go about their daily business? If you made an invention or developed a new procedure how is it better, faster, or cheaper than what is already out there? Motivate the reader to finish the abstract and examine your project.
2. **Problem Statement**. Identify the problem you solved and the hypothesis you investigated.

3. **Procedures**. What was your approach for investigating the problem? Don't go into detail about materials unless they were critical to your success. Do describe the most important variables if you have room.
4. **Results**. What answer did you obtain? Be specific and use numbers to describe your results. Do not use vague terms like "most" or "some." The results are usually in the form of a statement that explains or interprets the data. You do not go into any detail or explanations here. You simply say in words what your data is telling you. Example: "Test Plant 3 showed little difference in growth rate as compared to the Control Plant."
5. **Conclusion**. The conclusion is a summary of the research and the results of the experiment. This is where you answer your research question. You make a statement of whether your data supported your hypothesis or not and why based on your research and data.

**Example Abstract:**
*"What Mouthwash Kills the Most Bacteria?*
*The purpose of my science fair project is to show which mouthwash kills the most bacteria. My hypothesis is if you use the more expensive mouthwash, then it will kill more bacteria than the cheaper mouthwash. I tested my hypothesis by growing bacteria from my mouth and then putting different types of mouthwashes on the separate colonies of bacteria. I then analyzed the Petri dishes and compared what the bacteria looked like before the mouthwash was applied and after the mouthwash was applied. Finally, I came to my conclusion which was that my hypothesis was incorrect and the cost of the mouthwash did not make a difference."*

**Communicate your Results**: Tell people about what you have found out! Ex. Make a speech, participate in a Science Fair. For this project you will write a formal conclusion report to communicate your results.

**Bibliography and Acknowledgements**: One of the most important things for a student to do is recognize the people and resources used in developing and conducting the project. Name the people who offered knowledge or helped, and list the web sites, retail stores, magazines, books, computer programs, etc. that were used as sources of information or supplies.

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# *Helpful Websites (optional)*

**Choosing A Science Project Topic:**

- http://www.sciencebuddies.org/science-fair-projects/project_ideas.shtml?From=Tabhttp://www.sciencebob.com/sciencefair/ideas.php
- http://www.education.com/science-fair/middle-school/
- http://www.juliantrubin.com/sciencefairprojectsaz.html

**The Scientific Method:**

- http://www.sciencemadesimple.com/scientific_method.html
- http://www.biology4kids.com/files/studies_scimethod.html

**Writing an Abstract:**

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

**Background Research:**

- http://www.sciencebuddies.org/science-fair-projects/project_background_research_worksheet.pdf
- http://www.sciencebuddies.org/science-fair-projects/project_finding_information.shtml#howtofindinformation

**Hypothesis:**

- http://www.sciencebuddies.org/blog/2010/02/a-strong-hypothesis.php
- http://www.sciencebuddies.org/science-fair-projects/project_hypothesis.pdf

**Variables:**

- http://www.sciencebuddies.org/science-fair-projects/project_variables.shtml#whatarevariables

**Experimental Procedure:**

- http://www.sciencebuddies.org/science-fair-projects/project_experimental_procedure.shtml#checklist
- http://www.sciencebuddies.org/science-fair-projects/project_experimental_procedure.pdf

**Conducting an Experiment:**

- http://www.sciencebuddies.org/science-fair-projects/project_experiment.shtml#overview

**Data Analysis and Graphs:**

- http://www.sciencebuddies.org/science-fair-projects/project_data_analysis.shtml#checklists
- http://www.sciencebuddies.org/science-fair-projects/project_data_analysis_summarizing_data.pdf

**Conclusions:**

- http://www.sciencebuddies.org/science-fair-projects/project_conclusions.shtml#checklist
- http://www.sciencebuddies.org/science-fair-projects/project_conclusions.pdf

**Abstract:**

- http://www.sciencebuddies.org/science-fair-projects/project_abstract.pdf

**Bibliography:**

- http://www.sciencebuddies.org/science-fair-projects/project_bibliography.pdf
- http://www.easybib.com/

# 7th Grade Middle School Project Grading Rubric

Student: Date Graded:

**Understanding of the Scientific Method**

**(All these components should be included in the PowerPoint presentation or on the Website)**

| Category<br>Descriptions (check the boxes that are present) | Possible Points | Points Awarded | Teacher Comments |
|---|---|---|---|
| **Abstract**<br>☐ 250 words or less<br>Parts of the Abstract should include:<br>☐ purpose for experiment<br>☐ problem or question stated clearly<br>☐ approach for investigating stated<br>☐ results clearly stated<br>☐ conclusion: summary of research and experiment | 12 points | | |
| **Question**<br>☐ The question or problem is clearly stated | 8 points | | |
| **Background Research**<br>☐ Thorough research done on the topic | 12 points | | |
| **Hypothesis**<br>☐ Clear and testable<br>☐ Written as an "If – then – because" statement based off of research | 8 points | | |
| **Experimental Design**<br>☐ Variables identified<br>☐ Detailed materials listed<br>☐ Detailed step-by-step procedure listed<br>☐ Data displayed in appropriate pictures, tables, charts, and /or graphs<br>☐ At least 3 trials completed | 12 points | | |
| **Data Analysis / Results**<br>☐ Data is interpreted and statements are made that explain the data<br>☐ **Statement made of whether hypothesis was supported or refuted, NOT correct or incorrect or right or wrong.** | 10 points | | |

**Communicating Your Results –**

**This is a *separate piece* from your PowerPoint/Website. Your conclusion report should be written in a Word Document**

| | | | |
|---|---|---|---|
| **Conclusion**<br>☐ A written summary of the research and results of the experiment is given (300-600 words).<br>☐ The question or problem is answered<br>☐ The hypothesis is identified as supported or rejected based on experimental data.<br>☐ Reasons the hypothesis was supported or rejected are given.<br>☐ Conclusion is written in formal language (correct grammar, spelling, sentence structure) | 30 points | | |
| **Bibliography and Acknowledgements**<br>☐ All sources used are cited in MLA format<br>☐ Acknowledgements are given to anyone who assisted with the experiment | 8 points | | |
| **Total** | **100 points** | | |

# Checklist to help you keep track of your project steps:

(This is just an aid. You do not need to submit this page with your project. Check things off as you get them done.)

_____ Choose a project topic that interests you.
_____ Set up your logbook. Write EVERYTHING down in your logbook. (Question, research, hypothesis, variables, materials, procedure, data, charts and graphs, results)
_____ Gather your background information and write it down in your logbook.
_____ Formulate your hypothesis based on your background information. Write it down in your logbook.
_____ Plan your experiment. How will you test your hypothesis? Write your plan down in your logbook.
_____ Gather supplies for your experiment. Put your list of supplies in your logbook.
_____ Set up your experiment.
_____ Conduct your experiment. Be sure to follow proper lab safety procedures
(click here to read over lab safety guidelines BEFORE you start your experiment)
_____ As you are doing your experiment: Make observations, Collect Data, Take Pictures
_____ Write your procedure, observations, data down in your logbook AS YOU ARE DOING YOUR EXPERIMENT! Don't wait for after, you might forget something.
_____ Make your PowerPoint or your website. Be sure all the components in the above grading rubric are included.
_____ Develop your conclusion based on your research and the results of your experiment. Write your formal report, including your bibliography and acknowledgements. This should be done in a Word Document, not on your PowerPoint/website.
_____ Kmail your PowerPoint or your website link, and your conclusion report to your homeroom teacher by March 13th.

| Grade Level | Standard/Correlation | Correlation Number |
|---|---|---|
| 7th Grade | Georgia Performance Standard (GPS) | S7CS1-9 |
| 6th-8th Grades | Georgia Literacy in Science & Technical Subjects Common Core Georgia Performance Standards (ELACCGPS) | L6-8RST1, L6-8RST3, L6-8RST6, L6-8RST7, L6-8RST8, L6-8RST9, |
| 7th Grade | OLS | OLS Correlation: Unit 10, Unit 12 (ADV) |