HOW TO DO A SCIENCE PROJECT

Step-by-Step Suggestions and Help for Elementary Students, Teachers, and Parents

Brevard Public Schools

1. Get an Idea for Your Project

Find an area that interests you. You might want to look at a list of science fair categories to help decide. Talk over ideas with your family, teacher, or friends. Use TV commercials, magazines, newspapers, hobbies, sports, or books to get more ideas. Think about problems around the house that you would like to solve. You can even test household items.

2.Start a Daily Log

A detailed Daily Log with accurate records allows a scientist to describe their investigation so others can repeat it and try to replicate the results. Use a separate permanent bound or spiral notebook as your Daily Log and **divide it into two sections: "*Daily Work*" and "*Data.*"**

- In the ***Daily Work*** section write down all the things you do or think about concerning your project each day - like a diary. Write a **date for each entry** to show the day to day record of your progress while doing your project. Give details. Include your procedure, research, diagrams, changes to the experiment, bibliography, etc.
- In the ***Data*** section make charts **before** you start your testing. Record all measurements, readings, etc. in these charts **in ink as you measure them** during your testing. If you make a mistake draw a line through it and rewrite it. Do not erase or "white out." Data should not be recorded by typing. Record any and all other observations you make while testing also. A good scientist keeps careful, detailed records of findings and test results. Sometimes it's the unexpected observation that leads to a new discovery.

3. Do a Search for Background Information

Every scientist spends time getting background information. Use the library; write or call experts; write to companies and organizations; use the Internet* on your computer. Start keeping a bibliography with complete information on every source you used or tried to get. Good research will help you **become an expert** on your topic. As an expert, you will be able to make better hypotheses, plan better testing, and draw better conclusions. You'll also impress others with your knowledge when you share the results of your project with them.

4. State the Problem in a Question Form

This part (often used as a title) asks what you are trying to find or show in your investigation. Make sure your question or problem is one that can be **solved by testing**. It must involve more than a demonstration survey, or a collection. Don't confuse the use of "affect" (a verb) with "effect" (a noun).

5. State Your Hypothesis

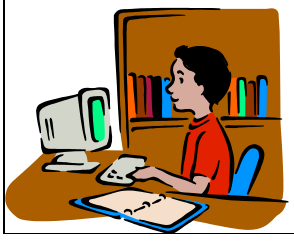
The hypothesis is **an educated guess or a prediction** of what you think will happen during your experimentation. Use background information to help you prepare this prediction and to explain it. Be sure to write your hypothesis **before** you start your experiment. The results of the test you do later do not have to support the hypothesis in order for the experiment to be a success.

6. Design the Experiment

Determine the **procedure that you will follow to test your hypothesis** and record it in your Daily Log. The procedure should explain the steps to be followed in order to find the answer to your question or problem. Think about necessary safety precautions that will be taken. Make a complete list in your Daily Log of all the materials you will need.

- Identify the conditions (also called **Controls**) that will be kept the same during the experiment. These will help you run a fair, scientific test that will give you valid results.
- Identify the one factor you will change (on purpose) to get a result. This is called the **Independent variable** (Also called Experimental or Manipulated variable).
- Identify how your results will be measured. This is called the **Dependent variable** (also called Responding variable). It's important to have results that can actually be measured. Use measuring tools with metric units whenever possible.
- Most experiments have a **Control Group**. This is the group of subjects that is treated in the "normal" way so you can compare them to the Experimental Group (the group of subjects that have the one factor changed.)

A good procedure is very detailed – like a good recipe. This makes it easy for other scientists to duplicate your experiment so they can verify your results.



7. Conduct the Experiment

Follow your procedure carefully to ensure fair, scientific testing. While testing, **record all data, in ink**, directly into your Daily Log. Don't write measurements on a piece of paper and then copy them into your log – this can lead to errors. Be accurate and exact as you observe, measure, describe, count, or photograph. **Work safely.** If necessary, make changes in your procedure and document them in your Daily Log.

8. Repeat the Procedure

The results will be more convincing and valid if you **repeat the experiment as many times as possible**. For example, an experiment that uses ten plants will give more valid results than one that tested only one or two plants. Testing and measuring the distance a car rolled down a ramp twenty times would be more valid than testing it only three times. Understand that an experiment must be repeated many times and yield consistent results before the results can be accepted.

9. Analyze the Data (Results)

Look at the measurements you recorded in your Daily Log closely. Think about the data and decide what the results mean. Try to find explanations for your observations. If possible, examine your results mathematically using percentages, mean, median, range, and modes. Be sure to know the meanings of these words if you use them. Construct graphs or tables that will go on your backboard to show the results more clearly. Charts and graphs can help us understand patterns of change. The data will help you decide whether your hypothesis is supported or should be rejected. Identify data that is contradictory or unusual and try to explain it in your conclusions.

10. Make Conclusions

Conclusions are statements telling what you found out or learned during your investigation. This is a very important part of your project since you probably learned a lot. They are based on the results of your experiment and your hypothesis. Explain how the data you collected supports your hypothesis. If the data doesn't support your hypothesis, explain why you reject your hypothesis. Explain what further testing might be done to better answer your original question. Through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas. Tell how people might apply your findings to everyday life. Can you explain any unusual findings from your testing?

11. Communicate Your Results in a Summary or Abstract

Scientists share their findings with other scientists. Write a **short, one-page, five-paragraph** summary (sometimes called an Abstract) that explains the most important parts of your project. An easy format to use is to **write one paragraph that summarizes each** of the following:

- Problem or question. State it and explain why you chose it.
- Hypothesis. Tell your prediction and explain why you thought it would happen.
- Testing. Give a general overview of your procedure telling how you used fair and scientific testing. Tell about your variables, how you had repeated trials or multiple subjects, testing time, and if you had a control group.
- Results. Summarize your data by telling your final measurements, totals, or averages. Share a few of the most important observations you made. Compare your control group to your experimental group – did one do better than the other?
- Conclusions. State whether your hypothesis was supported by the data you collected or not. Tell the most important thing you learned. If the project was to be repeated what changes would you make and why?

Practice an oral presentation also. **Be an expert** on all parts of your project so you'll be prepared to answer an interviewer's or a classmate's questions.

12. Construct a Display that Explains Your Project

Here are some suggested parts you will want to include in your display. These will help you to organize your presentation and to communicate information about your project to others:

- **PROBLEM or QUESTION** - Statement of problem in question form.
- **HYPOTHESIS** - Your prediction of what will happen and your reasoning.
- **MATERIALS** -A complete list of materials and equipment you used.
- **PROCEDURE** -Step-by-step explanation of how you tested.
- **DATA or RESULTS** - Shows the information you collected by testing. Includes **graphs,** tables, charts, diagrams, or photographs.
- **CONCLUSION** - Statements relating your data to your hypotheses to tell what you learned by your testing.

Display your Daily Log, Summary or Abstract, and Bibliography on the table in front of your backboard.

13. Be ready to answer question that judges often ask.

Below are sample questions that judges often ask students during judging interviews. It is a good idea to practice answering the following questions before meeting the judges:

- Can you explain or describe your project?
- What procedures did you follow that made sure it was a fair and scientific test?
- Where, or how, did you get the idea for your project?
- What kind of help did you receive while working on your project?
- What are the most important things you have learned by doing your project?
- If you had more time, what things would you do to change or improve your project?
- How much time did you spend working on your project?
- How can you apply what you have learned to "real life" situations?

Enter your project in the school science fair. Be sure to follow the rules. Set up your backboard, Daily Log, Summary or Abstract, and Bibliography at the fair. Have fun showing others what you have learned!

*Use Internet sites for more information about science projects - go to:
http://elementarypgms.brevard.k12.fl.us/science_fairs.htm