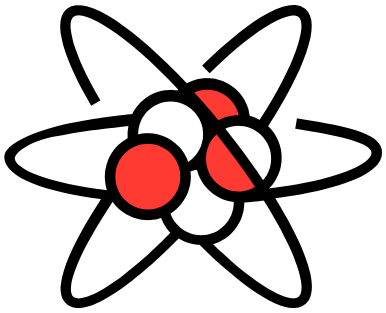
Please Note!

This handbook is only a guide to help you with your Science Fair project. More detailed criteria and specific expectations for your project will be covered in class. I also strongly encourage you to "check in" with your teacher throughout this project, especially where the science is concerned.

Shaughnessy Elementary School

Science Fair Handbook

2014



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Getting Started With Your Science Fair

(from: Science Fair Foundation)

A. Project Process

Research Topic: Read books from the library; observe related events; gather existing information; look for unexplained or unexpected results. Talk to professionals; write to companies; and obtain or construct needed equipment.

Organize and Theorize: Organize your research. Narrow down your hypothesis by focusing on a particular idea.

Make a Timeline: Choose a topic that can be done in the amount of time you have. Identify important dates. Allow plenty of time to experiment and collect data. Leave time to write a paper and put together an exhibit.

Plan your Experiment, Study or Innovation: Write a research plan to explain how you will do your experiment.

Consult your Teacher: Discuss your work with an adult supervisor on an ongoing basis.

Conduct Your Experiments, Study or Innovation: Keep detailed notes of every experiment, measurement, and observation. Change only one variable at a time when experimenting. Include control experiments in which none of the variables are changed. Include sufficient numbers of test subjects in both control and experimental groups.

Examine Your Results: When you complete your experiments, examine and organize your findings. Did your experiment give you the expected results? Was your experiment performed with the exact same steps each time? Are there other causes that you had not considered or observed? Were there errors in your observations? If possible, analyze your data statistically.

Draw Conclusions: Which variables are important? Did you collect enough data? Do you need to do more experimentation?

B. Project Categories

1. Exhibition Categories

Computational and Mathematical Sciences project deals with computer hardware or software innovation, or both.

Engineering Sciences project involves the design and/or physical construction of some device, appliance, machine or process that has an application.

Life Sciences project involves biology, zoology, botany or aspects of pure or applied medicine. *(**Please note**: live animals are not to be displayed and procedures which could harm or distress animals are not to be used.)*

Physical Sciences project is related to physics or chemistry. Its primary objective is a consideration of the cause and effect of some abiotic process or activity.

The Earth and Environmental Sciences project has as its focus either a topic related to planetary processes or the relationships of organisms to those processes, or between or among organisms. Projects in this category would include the fields of geology, mineralogy, physiology, oceanography, limnology, climatology, seismology, geography or ecology.

The Biotechnology project demonstrates the application of knowledge of biological systems to solve a problem, create a product or provide a service in one of three subject fields: crop development, animal science or microbial.

2. Types of Projects

Experimental: an investigation undertaken to test a specific hypothesis.

Study: a collection and analysis of data to reveal evidence of a fact, situation or pattern of scientific interest. It could include a study of cause and effect relationships or theoretical investigations of scientific data.

Innovation / Invention: the development and evaluation of innovative devices, models, techniques or approaches in technology, engineering, or computers.

C. Written Materials

A science fair project requires the following written materials:

1. **Abstract (Grade 7 only):**

An abstract is written once your research and experimentation are complete. It should include a statement of the problem/purpose of the experiment, the procedures used, your data and your conclusions. For the Canada-Wide Science Fair, your abstract must not exceed five double-spaced typewritten pages. Check locally for requirements of your regional fair. Abstracts are distributed to the judges to familiarize them with the project. The abstract is evaluated as part of the project.

2. **Project Data Book (Grade 7 only):**

A project data book should contain accurate and detailed notes to demonstrate consistency and thoroughness to the judges and to assist you with your research paper.

3. **Lab Report:** A lab report includes the following:

Title Page: Centre the project title and put your name, school and grade at the bottom right.

Table of Contents: Include a page number for the beginning of each section.

Introduction: Includes your question and hypothesis, an explanation of what prompted your research and what you hoped to achieve.

The Experiment: Describe in detail the methodology used to collect your data or make your observations. Include enough information for someone to repeat the experiment. Include detailed photographs or drawings (i.e. materials and procedure).

Analysis: Thoroughly discuss exactly what you did in your project. Your results should be compared with theoretical values, published data, commonly held beliefs and/or expected results. A discussion of possible errors should be included as well as how the data varied between repeated observations, how your results were

affected by uncontrolled events, what you would do differently if you repeated the project, and what other experiments should be conducted.

Conclusion: A summary of your results. Was your hypothesis correct? Did you answer your question?

Application: How can you apply your project to a real life situation?

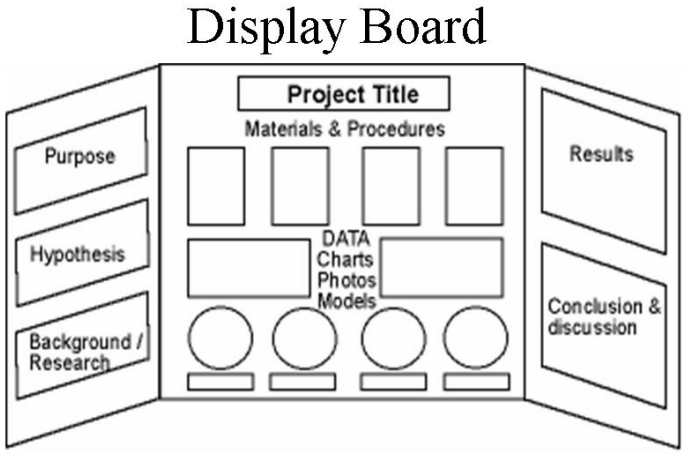
Acknowledgements: Credit individuals, businesses and educational or research institutions which assisted you. Identify financial support or in-kind donations.

Works Cited: List any documentation that is not your own (i.e. books, journals articles, internet sites).

4. Project Display

Your project should attract and inform, be easy to assess the study and results, and make the most use of space with clear and concise displays.

Where to Buy : *Staples* or *Office Depot* both have trifold project display boards that measure 36" height and 48" length and are made of sturdy corrugated display board. They also come in a variety of colours.



Arrange information so that it is easy to read and flows in a logical order.

Top to bottom and left to right.

The display should include headings that stand out, posters containing written material and charts, clearly drawn and correctly labeled graphs and diagrams, and some of the apparatus used so that key aspects of the project can be demonstrated. Photographs are also highly recommended to show set-up and results.

D. A Controlled Experiment

To conduct a scientific investigation, care must be taken to follow experimental procedures. You must design an experiment to test your hypothesis.

- When planning your experiment remember to:
- Keep everything the same except for the single variable being tested.
- An independent variable is something that can be changed in the experiment. It is what you are testing. Everything else must be the same and only one variable or condition is altered or changed.
- A control group should be used when conducting an experiment. This group receives the same attention as the test groups; however, it will not be influenced by the variable the other groups that are being tested.

E. Charts and Graphs

DISPLAYING DATA:

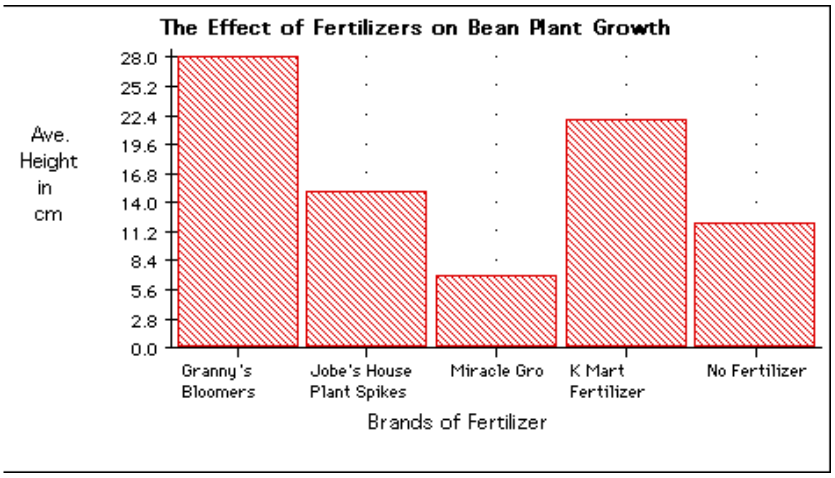
Tables, charts and graphs are convenient ways to clearly show your data. Be sure to consider how to best show your results with appropriate graphic forms. You might want to consult with your science teacher. Be sure to give your charts and graphs an appropriate title that explains what the data measures. On line and bar graphs, the x and y axes must be appropriately labeled with correct unit of measure (in metrics where applicable).

The easiest way to create a graph is to enter your data into a spreadsheet program (*Microsoft Works, ClarisWorks, Excel*, etc.). These programs will generate graphs from the data you enter. The examples of graphs included below were done in *Excel* but could easily be replicated in any spreadsheet program.
There are three basic graph forms. The **bar graph**, the **line graph**, and the **circle (or pie) graph**. Notice how each of the following examples are used to illustrate different kinds of data. Choose the best graph form to express your results.

1. A Bar Graph:

A bar graph is used to show relationships between groups. The two items being compared do not need to affect each other. It's a fast way to show big differences. Notice how easy it is to see what was done in the experiment below with bean plant growth and different brands of fertilizer.

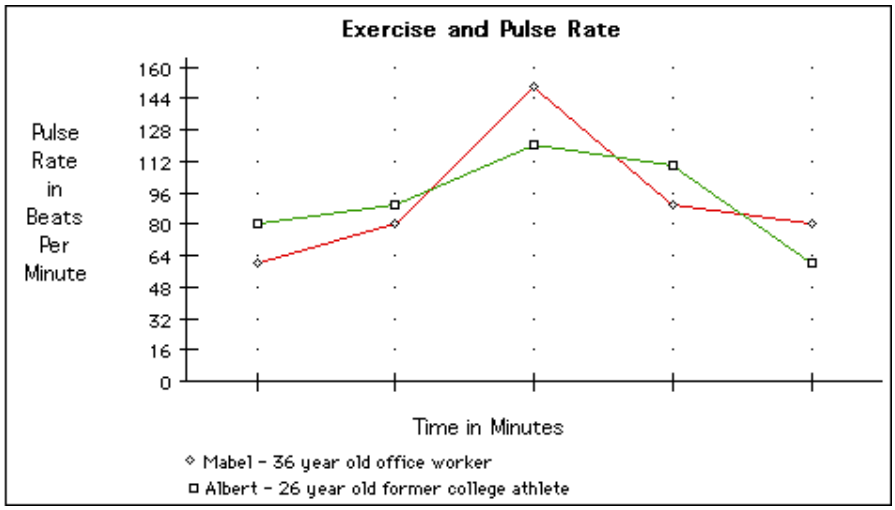
A typical chart or table for this graph might look like this:



2. Line Graph:

A line graph is used to show continuing data; how one thing is affected by another. It's clear to see how things are going by the rises and falls a line graph shows. This kind of graph is needed to show the effect of an independent variable on a dependent variable. In the sample below, the pulse rate of a person is shown to change over time. As time continues, the pulse rate changes.

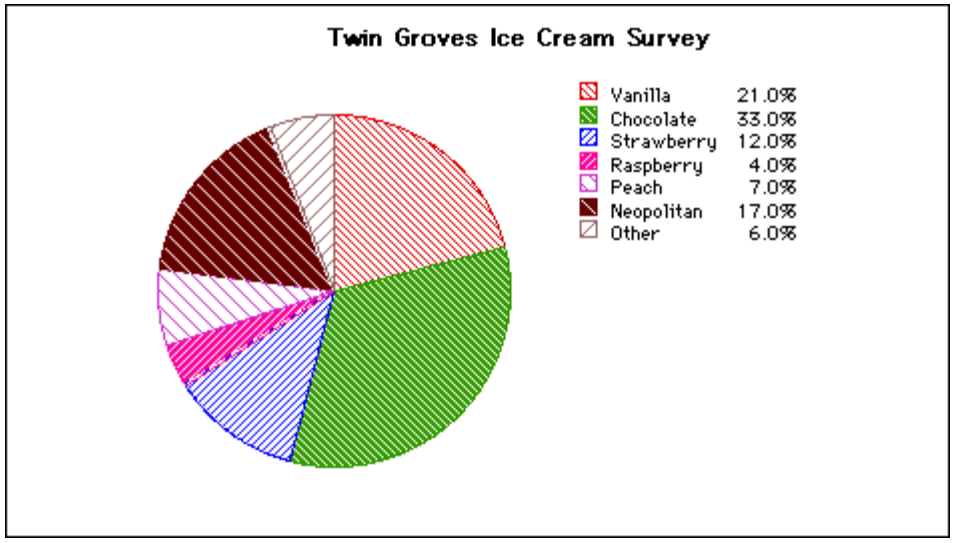
A typical chart or table for this graph might look like this:



3. Circle (pie) Graph:

A circle graph is used to show how a part of something relates to the whole. This kind of graph is needed to show percentages effectively.

A typical chart or table for this graph might look like this:



Reminders:

1. All measuring is to be done accurately and consistently using metrics where applicable.
2. Keep a detailed daily record or log book for measurements, changes and problems.
3. Take photographs, make diagrams or drawings of various phases of your experiment.
4. Observations and measurements should be organized in tables or charts that are clearly labeled.
5. Results should be graphed using one of the three methods described above.
6. Don't become discouraged; work diligently and repeat an experiment, if necessary.

F. The Display Board

When you plan your science fair board, remember this is a case in which you CAN judge a book by its cover. If you do a really good job at completely your display, everyone will stop to look at your project. However, if you do a messy job, no one will take the time to discover all the fascinating research you have done or look at the results of your wonderful experiment or invention.

PLAN YOUR BOARD:

Make a small sketch of where everything will go. Lay it out before you glue anything down to make sure it looks good.
Design what the "center" of your board will be. This is where everyone will look first. Will it be the title or pictures? Everything else should be placed around this.
When you set up your board, put things together in an order that makes sense. Remember, we read from left to right so don't put your work you did near the end (like the conclusion) on the left side of the board.

COMPONENTS OF YOUR BOARD:

You should have the following components on your board:

1. TITLE and QUESTION - The title can be the question in a "catchy" form. If your title is different that our question, then make sure you also include your question.
*Ex. Your question might be, "**What bath soap removes the most bacteria when washing your hands?**" but your title might be "**Splish Splash I Was Taking a Bath**".*

2. RESEARCH - You might want to include a short paragraph that gives the background information on which you based your hypothesis.

3. HYPOTHESIS - This is your educated guess based on your research.

4. ABSTRACT (Grade 7 only) - Sometimes it is put on the board and sometimes it is put in front of the project. It is a short summary of your project. It is usually a separate page and includes the project title or question, your purpose for completing this project, the hypothesis, a brief description of the procedure you followed, and the results of your experiment. Your teacher may just require a copy of your lab report.

5. EXPERIMENT - This is the procedure you followed to do your experiment. It should follow the scientific method and include:

Materials
Procedure
Variables

6. DATA/ANALYSIS - These are your results displayed in a way that your audience can understand. It is usually displayed in a table, graph, or photographs. It is an "analysis" of what you have done.

7. CONCLUSION - This is a statement of whether your hypothesis was right or not; if it wasn't right, why you think it turned out the way it did, and what you do differently next time.

8. APPLICATION – Describe how the new information you gained from doing the experiment relates to real-life situations. How can this information be used?

EXTRAS: You should at least one of the following:

ILLUSTRATIONS - These can be photographs that you took off the web, that enhance your project. They can also be containers or labels of products you used in your project. See below.

ACTUAL MODEL OR EXPERIMENT - This is the actual equipment you did at home or a model of your topic.
Ex. If your question was "Does age affect lung capacity?", you might make a model of the human lung or have the actual equipment you used to test this experiment.

COLORS AND TEXT:
1. You can use the labels that come with your board or create your own. Labels created on the computer can be very effective. Try using a different font or color for each of the labels.
2. Use colors that are appealing. They should contrast with your board color. If you have a white board, make your text a bright colour(s). You must back your text with colored paper to make your text stand out.
3. Type your text using a legible font. Use stencils or premade letters if you prefer for your headings only. Make your lettering large enough for everyone to see (at least size 24 font).

DISPLAY YOUR DATA:
You may display your data in a table or graph. Make sure your graph reflects the kind of data you have collected.
A line graph demonstrates change over time.
A bar/picture graph demonstrates a comparison between two or more things.
A circle/pie graph compares parts to the whole.

Graphs and tables should be neatly done. Use computer generated graphs and tables or make them yourself. Use a ruler and colored pencils or markers to make them really eye appealing.

ILLUSTRATIONS: 

Sometimes your results can be shown by photographs or pictures. Photographs and pictures also enhance a display, especially if you don't have the actual experiment because you used something that can't be displayed (i.e. pets, family members). You may also use computer generated graphics.

FINISHING TOUCHES:

- Make sure you proofread all your written work.
- Use a ruler.
- Don't use pencil. It looks unfinished.
- Erase all pencil guidelines.

There is no one correct way to set up your board. It must, however, make sense and follow the steps of the scientific method.

Remember:

- If you use a title, you still need the question (or problem).
- We read from left to right and from top to bottom. Group topics that go together like: question, research, and hypothesis; materials and procedures; analysis, conclusion and application.
- Put pictures and graphs where they fit best and make the most sense.

G. Some helpful websites:

www.sciencefairs.ca
www.sciencebuddies.org
www.scienceworld.bc.ca
www.science.ca
www.discovery.ca
www.spacecentre.ca
www.cbc.ca/quirks

NOTES: