Your Science Fair Project

Preparing a project for the Glenridge Science Fair consists of:

1. Log Book - daily **written** observations/actions...everything on your display (and then some!) is in your logbook.
2. Selecting a topic of interest.
3. Researching published scientific knowledge regarding your topic.
4. Forming testable questions about your topic and choosing **one** question to answer (your problem you hope to solve).
5. Identifying your variables (independent/dependent) and constant conditions so that you are testing **only** that one question.
6. Developing clear and specific procedures, including materials and methods.
7. Forming a hypothesis with specific, predicted outcomes **and** rationale ("If...then" statement).
8. Performing the experiment with at least **three** trials...be safe & have fun!
9. Collecting data using data tables and observations.
10. Analyzing your data and creating a graph.
11. Drawing conclusions based on your findings.
12. Evaluating the effectiveness of your study relative to your life and the scientific community.
13. Communicating your experience via a project display board or electronically at the science fair.

The Log Book

- A daily, written account of your actions and observations.
- Kept in a notebook or journal.
- Can include happenings from class (i.e. "Today we played Science Fair Bingo. Now I know what a variable is."), thoughts ("I think..."), reflections ("I wonder... I feel..."), decisions, actions, research, interviews, observations (descriptions and illustrations), data, conclusions, and anything else related to your study.
- Dated entries.
- Numbered pages.

Selecting a Topic/Testable Questions

- What do you enjoy? What are your hobbies?
- What scientific interests do you have?
- What new information (**research**) can you learn that will help your study?
- Make **observations** and start asking **questions**.
- Which questions can be answered with data (numbers)? Is there a **measurable** outcome?
- Sample question starters: "Will changing _____ affect the _____?" "How will _____ be affected if I _____?"
- You want to discover how one action will impact your topic. Can you adjust these actions incrementally?
- Make it relevant! Is this question meaningful to you? Can you use the information later in your life? Is it a realistic question that actually has some value? DON'T WASTE YOUR TIME!
- This is referred to as your ***Background Information***.

Posing your Problem

- The question your experiment asks.
- Includes the independent and dependent variables in the question.
- Ex: "How does changing the _____(independent variable)____ cause the _____(dependent variable)_____ to change when all other conditions (constant conditions) remain the same?"

Identifying your Variables

- Independent Variable (I.V.): the **one** thing that is changed or tested in your experiment. ****Hint: Design an experiment that tests your I.V. incrementally!****
- Dependent Variable (D.V.): the thing that is being **measured** as a result of the change...it *depends* on what you are testing.
- For example...What if you want to know what type of soil helps plants grow the best? Practice by labeling the I.V. and D.V.
- Constant Conditions (C.C.): everything else in the experiment that is kept the **same**...could be A LOT! This process is necessary for a fair test; otherwise your results could be invalid. Ensure that you're testing JUST ONE THING!
- For example...Practice by listing the constant conditions necessary to conduct a fair experiment that tests ONLY the best soil for plants.
- Control: sometimes used to compare with the results of your tests. Your independent variable is not used on this trial.

Developing your Procedures

- Another person should be able to do the exact same experiment and obtain the exact same results.
- Like a recipe or a "how-to" piece of writing.
- Materials: **everything** needed to conduct your tests...include exact quantities (amounts)...METRIC!
- Methods: a complete, step-by-step description of the experiment...includes illustrations and/or photographs for detail...explains how, when, and why to collect data...identifies safety procedures. Try performing a sample run-through of your experiment before your official tests...don't forget to write this down in your log book!

Forming a Hypothesis

- Sometimes referred to as an "educated guess." If it's "educated," you must think deeply about what you already know and specifically predict what will happen.
- Attempts to answer the question that is stated in your problem **before** you conduct the experiment.
- Includes *specific* results with a **rationale** (reasons for your prediction...usually includes PRIOR KNOWLEDGE & RESEARCH).
- "If...then" statement.
- Ex: "If I change the ____(I.V.)____, then I think ____(D.V.)____ will ____(change...how?)____ when all other conditions remain the same. I think this BECAUSE _____."

Performing the Experiment

- #1 Rule: SAFETY! Did you include safety measures in your procedures?
- Adult supervision required.
- At least 3 trials...anything less may not give you the true results.
- Allow yourself plenty of time.
- Stick closely to your procedures and be sure to maintain your variables/C.C.'s...adjust each accordingly as necessary.
- Collect data and make observations...RECORD EVERYTHING IN YOUR LOG BOOK!
- Be as accurate and precise as possible... *think it through!*
- **Have fun...you're a scientist!** ☺

Collecting & Analyzing Data

- Observations include words, pictures/illustrations, and numbers (metric measurements).
- Collect and record results from all trials in a chart or table.
- Design your chart according to the elements of your I.V.
- Calculate the average of your trials for each element of your independent variable.
- Graph your averages with the independent variable on the x-axis (horizontal line) and the dependent variable on the y-axis (vertical line)...be sure to include a title, labels, and a key!
- Your original copy is in your log book...the final/neat copy goes on your display.

Drawing Conclusions

- Arguably the most important element of your project!
- Three written paragraphs.
- Paragraph 1: **summarize** your project...describe your overall results (include some of your observations) and **evaluate your hypothesis** (was it supported or not supported...how do you know?).
- Paragraph 2: **analyze** your project...Was it valid, reliable, and thorough? What kinds of problems did you encounter? Did they affect your results? Could someone else duplicate your experiment? Did you come up with any other questions throughout your experience? How could you conduct any further study? In what ways could you test the same idea to learn more about it?
- Paragraph 3: **scientific worth & research**...What value do your findings have? How does this scientific knowledge apply to the real world? How can you use this information in your life? DO SOME MORE RESEARCH...What do other scientists have to say about this new learning? Apply your findings from your experiment to this new knowledge in your research. What have you learned? Find information from *at least* **three** sources and cite them properly in a bibliography.

Communicating your Project

- Display board.
- Include the following:
    1. Catchy title
    2. Problem statement
    3. Background information
    4. Hypothesis
    5. Variables
    6. Procedures
    7. Results
    8. Conclusions
    9. Log book
- NO-NO's: faces in photos, names, liquids, live organisms, breakables, hazards, etc.
- Reminder: everything on your board should also be included in your log book!

- Sample board layout:

<table>
<tr><td>Problem

Background Info.

Hypothesis</td><td>Title

Variables

Procedures</td><td>Results/Data
(observations, chart, graph)

Conclusions</td></tr>
<tr><td colspan="3">Log Book</td></tr>
</table>

- Other option: Electronic Display (all of the parts of your project can be put together using a Power Point or Keynote slide show document and displayed using laptop computers!)

Notes: