

## **Step 1**

### **LOG BOOK**

Students will purchase a composition book. This book will be used as a journal where everything they do pertaining to their project will be recorded. Every time a student does any work on their project, they will record the date and what they did, whether it is researching topics on the Internet, taking notes for their final report, when they handed in forms and received approval for their project, or gathering data while experimenting. **BE SURE TO DATE EVERY ENTRY.** The rough draft of the final report should also be in the log book. Log books should be in ink. If an error is made, simply draw a line through the mistake. You should never scratch out, erase, or tear out pages. (This is how a real scientist works.)

## **Step 2**

### **Topic Selection**

In order to complete a successful science fair project, students will need to select a topic from which an experiment can be created. This is probably the hardest part, deciding what to do! Time will be spent in class going to the media center and computer lab to research topics.

In step 6, students will write a formal report on their chosen topic. Therefore, once students have chosen a topic, they should also do research into the topic, not only to see what others have found out about the topic, but also so that the student can write a valid hypothesis. When a student finds a good website, they should make a copy of the article for taking notes in step 6, writing the report. Students should make copies of 5-6 articles to use in their report. These copies should be kept in a folder labeled "reprint file."

Taking the time to read these articles now will help them formulate a hypothesis, design their experiment, have a more thorough knowledge of the topic, and write their report.

There are many things that need to be considered when selecting an appropriate topic.

Can an experiment with measurable results be created? (In other words, what can be measured over time?) Examples include measurement of change over time, growth, volume, speed, increase or decrease of populations. Measurable data is a must for an experiment. This eliminates demonstrations as opposed to a real scientific experiment.

Other factors to consider: Does it interest me? Will it keep my interest? Is it doable in the time frame? Can I get the needed materials? Is it affordable? Is it safe? Is there someone outside of school who can help me if I need it?

Does this experiment have ONE independent variable? (see page 6)

## **Step 3**

### **Write a Proposal**

The proposal is a description of what you wish to do for your project. **IN YOUR LOG BOOK**, you will write your proposal and give it to your teacher for approval. Your proposal should include the problem (What are you investigating?) Write the problem in the form of a question. (Example-"Will the addition of organic fertilizer enhance plant

growth more than commercial fertilizer?") Next, write a DETAILED description of your proposed procedure. (How you plan to do the experiment.) Then identify your variables. Independent variable-the factor that you are changing.

Dependant variable-the factor you are measuring.

Constant variables-what are you keeping the same in each test group or trial.

Control-in some experiments a control group is necessary. This would be what you do not apply the independent variable to for comparison.

Example-

If you were doing the above mentioned experiment with organic fertilizer and commercial fertilizer,:

Independent-type of fertilizer

Dependent-measurement of plant growth

Constant-container size, type of plant and soil, amount of sunlight and water would be the same for all groups

Control-a set of plants that you do not add any fertilizer to

. DO NOT BEGIN ANY EXPERIMENTATION UNTIL YOUR TEACHER APPROVES YOUR PROJECT AND ALL THE CORRECT FORMS HAVE BEEN COMPLETED.

#### **Step 4 Forms**

If you have never done a science fair project at the middle school level, this may be new to you. ALL students must fill out forms 1, 1A, Research Plan Attachment, 1B and 3. Your teacher will tell you if your project requires any others. (IF your project involves humans, vertebrate animals or dangerous/hazardous materials, biological or not, they require prior approval by appropriate county committees. Get the required extra forms to your teacher and they will get them to the proper approval committees.) You can access these forms at [www.sciserv.org](http://www.sciserv.org) or your teacher may give you copies. Be sure every blank on the form is completed, especially signatures and dates. Forms MUST be completed in blue ink. Be sure to record the date you submitted forms and the date you received approval to start your project in your log book. Log books will be checked to be sure that no experiment was started before all forms were approved. You MAY start your research prior to form completion and project approval but not your experiment. On form 1A, the actual start date for your project refers to the date of experimentation, not research. See final checklist before submitting.

#### **Step 5 Experiment begins**

Once steps 1-4 have been completed, students may start their experiment. All aspects of the experiment should be noted in log book. Starting with the date, students will write the purpose and hypothesis, and then list all materials necessary to complete experiment. A chart should be created to record data on a daily basis, indicating any changes in the measurable (dependent) variable. Students will make note of any other interesting or

unexpected changes which occur. All experiments should be replicated (done over) at least 5 times OR in other types of experiments, large populations used. (Example-100 baby lima bean seeds were planted in each test group.) All data will be plotted on graphs and data averaged for easier analysis. It is important to take accurate measurements using metric measure (meters, liters, grams, Celsius, NOT feet, cups, pounds.) Be sure to allow plenty of time for your experimentation stage. It is suggested that you take pictures along the way to place on your show board.

## **Step 6**

### **Writing the Research Report**

You will write this report using the notes and copies you made of Internet articles in step 2. IF you did not gather enough information to write a report, you will need to gather more. As you read through the articles, highlighting information specific to your topic. For example, if your project involved using organic substances, such as egg shells and coffee grounds as fertilizer to see if they would increase growth rate of geranium plants, your research should be specifically related to geraniums and organic fertilizers, NOT just generic information about plants.

Your teacher will specify a suggested length of your report; each teacher has their own preferences. However, you must have a minimum of 5 major sources (an encyclopedia is not a major source). IF your experiment involves a vertebrate animal, you must have one additional source on care of that animal. This report can be started at any time, and should be worked on (and could be completed) while you are waiting for your forms to be approved. (Step 4)

## **Step 7**

### **Final Report-Putting it all together**

You are now ready to take your research paper and your experiment and put them together in writing. Below is a table of contents guide to help you. This should be computer generated. Title each page, put page numbers on each page, and place only one topic on each page. (This will make it easier to enlarge each part to place on your show board.) Everything in your final report should be 12 font. You can either include your research paper in this folder (and add it to the table of contents) or place the research paper in a separate folder titled research paper.

#### **Table of Contents**

**Title Page** (your project title and your name)

**Abstract** (see step 8)

**Table of Contents**

**Introduction** Sets the scene for your project. The introduction includes your problem, hypothesis, and explains what prompted you to select this project and what you hope to achieve.

## **Materials and Procedure**

**Data** (tables and graphs)

**Analysis of Data** (explain your data in words)

**Discussion** This is an important part of seeing if you understand your results. Compare your results with what your research indicated the results should be. Include a discussion of possible errors in your experiment which gave you results other than expected. Did your data vary when you replicated your experiment? Did anything occur that altered your results that were beyond your control? What would you do differently if you repeated this experiment?

**Conclusion** This is the answer to your problem question. Be specific.

**Recommendations** (How do you feel the experiment could be changed? If something went wrong, discuss how the error could have been avoided. If you have any ideas to improve your experiment, explain them here.)

**Acknowledgements** (Thank all the people who helped with your project)

**Bibliography** (must be MLA format, examples included on a later page.)

See ISEF rules book ([www.sciserv.org](http://www.sciserv.org)) for more details of how to do each step above.

## **Step 8**

### **Abstract**

The abstract is a summarized version of your entire project. It is usually what the judges read first, so word it carefully. It **MUST** be typed on the official state abstract form, [www.ffffs.ucf.edu](http://www.ffffs.ucf.edu). In the abstract, you use a three-paragraph format to tell what you were trying to do, how you did it, and what conclusion you came to. So basically, purpose, hypothesis, procedures, data analysis and conclusion should be included. It should be written in past tense and should be 200-250 words in length. Be sure to fill out heading box, check off category answer the questions on the bottom and **SIGN** it. Make 3 copies of your abstract. One for the final report, one for your show board and keep one to make copies if needed for the regional fair.

## **Step 9**

### **Show board**

Once **EVERYTHING** else is completed, you will make a show board to show the highlights of your work. The board should be neat and organized, as it is the first thing the judge sees when approaching your board. The board should include a title, problem, hypothesis, procedure, variables, data graphs, results, and conclusion. An abstract **MUST** be in the lower left corner. On the day of the fair, your show board, log book, final report, and reprint file will be displayed. You should plan on having everything complete at least 7-10 days before the school fair, as you will need to present your project in class and should practice presenting it at home so you will shine!!!

Sample board

## **TITLE**

**Problem**

**Materials**

**Data**

**Hypothesis**

**Procedure**

**Data Analysis**

**Abstract**

**Variables**

**Conclusion**

## **A FEW FINAL COMMENTS**

If you are working with any chemicals, even common household ones, you must go on Google and type in the name of the chemical + MSDS. (material data safety sheet) Print a copy of the MSDS, put it in your log book and cite it in your bibliography.

NO microbiology projects are allowed to be done at home or school except baker's yeast, brewer's yeast and protists. NO OTHER FUNGI or bacteria project can be done at home. Projects dealing with these MUST be done with a qualified scientist at a research institute. Forms 1C and 2 must be completed and approved before experimentation.

Product comparison is not suitable for middle school projects.

Data should be graphed using the Excel program. (directions follow)

Any project that does not meet the approval of the review committees must not be pursued. Any experimentation started before your teacher gives you the final approval will be disqualified.

After filling out the forms, but before submitting them to your teacher, review Final Checklist before submitting forms (attached) to be sure you did everything correctly.

**PARENTS** We always need judges for the school fair. If you are a professional in any field, and can volunteer a few hours on the day of the school fair, please contact Ms. Buker. Any parent who would be willing to help in December with getting the students boards assembled, contact their science teacher.

If you need any science equipment or need to order supplies from a scientific supply catalog, check with your science teacher. If you need plants to do your experiment, see Ms. Buker as soon as possible and she will TRY to get you a large quantity free of charge.

