Science Fair Handbook
Agapé Jr. Academy

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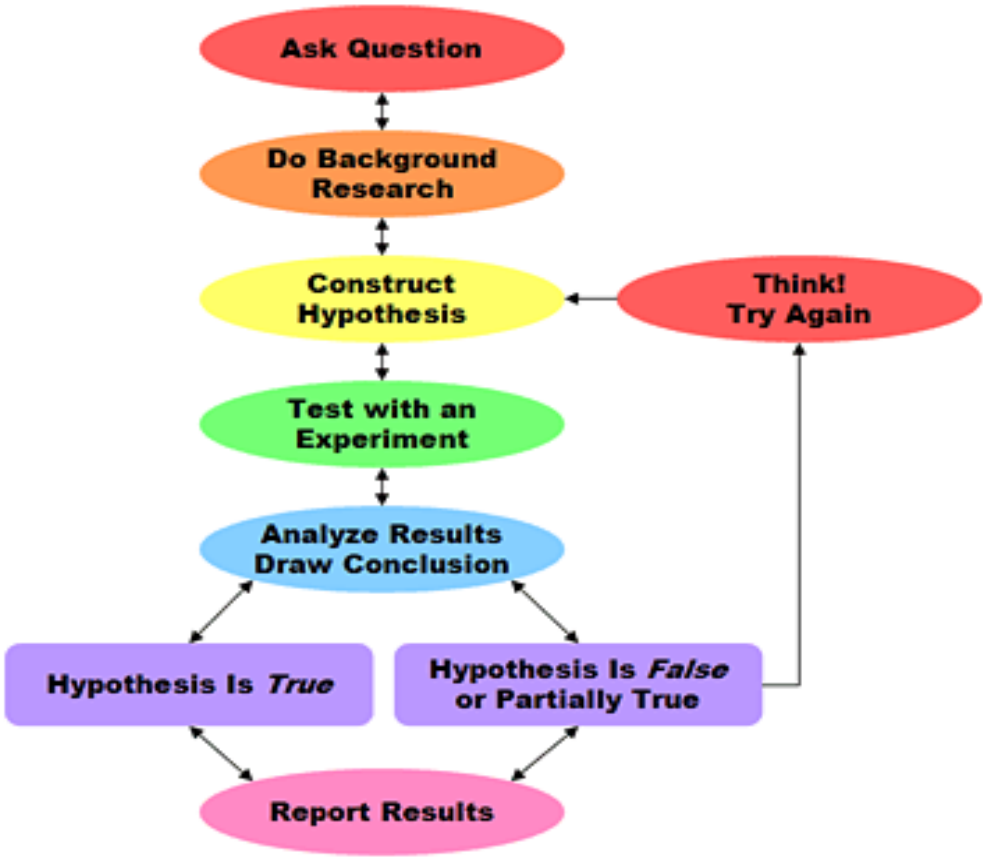
2016-2017

SCIENCE FAIR PROJECTS



OBJECTIVES:

The primary purpose of science projects is to involve students in critical thinking and investigative processes.

Science projects give students the opportunity to study a subject of individual interest and to put the scientific method to use. The student must conceive and plan a project, perform an investigation, and analyze data to arrive at a conclusion.

Science projects help students improve their organizational skills and time management skills. Science fair projects teach problem-solving skills. All of these skills are life skills that will help them succeed in every area.

Science fair projects enhance written and oral communication skills. Students will do extensive research; collect data, and present information in a variety of ways. Science fairs help students develop public speaking skills while presenting their projects to classmates and/or judges.

Students who participate in science fairs should be proud of themselves. This is a good way for students to show their commitment to academic achievement.

We are proud of every student who undertakes this challenge. This booklet is designed to provide students with a thorough description of the procedure they should follow when preparing their science fair project.

Have Fun!

SELECTING YOUR TOPIC

Remember that a science fair project is an investigation you do to find an answer to a question, not just showing what you already know about a subject. **It is NOT a collection of objects, a report, a model, a demonstration, or an invention.**

Select a topic that you are personally interested in. If you are interested in your topic you are more likely to want to learn about it and your enthusiasm will excite the audience when you share your findings with them.

Judges look for original idea. You can get ideas from books or other people, but explore something new or innovative. Find a new way to solve an old problem or a better way to do something. You can get ideas from the internet by doing a Google search.

http://www.sciencebob.com/sciencefair/ideas.php

Be sensible, have an idea that is based on a well-defined goal or sound scientific concept. The judges will want to know why you are asking this question. Try to figure out exactly what is it you are trying to prove and how this information would be useful.

Pick a topic that you understand and can do the work on. It is okay to have help from adults, but you are the one who has to get up in front of your classmates and explain it and answer the questions from judges. So make sure that you understand your subject and can interpret your data.

Choose a topic that you can research and that you can afford to do experiments on without breaking the bank. You may have some wonderful ideas that are just beyond your educational or financial level at this time. So try to pick a topic that is within your limits.

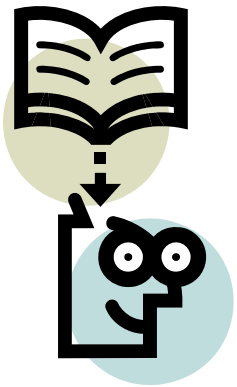
FINDING A TOPIC

The best way to get started is to brainstorm ideas that interest you. Just make a list of topics and subjects that you like and want to know more about. Carry a notepad around for a few days and jot down ideas that come to you as you read magazines, newspapers, watch television, and interact with family and friends.

Magazines, newspapers, news shows on radio, and TV are great sources for ideas for projects. Our everyday events constantly present good questions that need further investigation.

There are many science books with science fair ideas. The internet is a vast resource for science fair information. It has samples of projects from around the world. Use them as ideas to stimulate your own imagination. Many of them give ideas in their conclusions on how they would revise their experimentation if they were to repeat it. Try to think of a better way to do it.

Don’t overlook the community as a resource. These are a lot of people around you who are good sources of information and ideas. Talk to them.



STUDENT IDEAS FOR PROJECTS

- **INTEREST OF STUDENT**
- **INTERNET**
- **MAGAZINES**
- **WWW.SHOWBOARD.COM**
- **IDEA SHEETS**
- **OLD PROJECTS**
- **LOCAL ENVIRONMENT**
- **CURRENT EVENTS**

Always keep in mind as you choose your topic that you must be able to set up an experiment to answer a question that you are asking.

PLANNING YOUR PROJECT

Give yourself plenty of time to complete your project. Make a time line so you don't put things off until the last minute.

You need time to do the background research. Making trips to the library, setting up appointments to interview people, and contacting companies through the mail or over the internet takes time.

It takes time to collect data and make observations. Sometimes even the best experiments can have something go wrong. So give yourself some extra time in case you have to start over and /or repeat an experiment. Each experiment is different and requires a different time frame. Some experiments can be done over a weekend, while others take weeks of observations.

Some experiments must be approved by a review board before experimentation can even begin and a student must plan for that. There is a lot of paperwork involved with science fair projects. The forms must be filled out and turned in to the teacher. Some of the experiments require extra forms with approval from experts in the field of study. So sit down with a calendar and set up some dates to use as a guideline for getting different parts of your project done.

A timeline is included to help you plan out your project. Your teacher will also give you a timeline of due dates for certain parts of the project. Fill in the dates and make them realistic so that they coincide with what has been set by the teacher. Make sure to avoid any family conflicts.

AGAPÉ JR. ACADEMY SCIENCE FAIR
TIMELINE

2016-2017

	Due Dates
Topic Selection	9/5/2016-9/12/2016
Background Research	9/12/2016-10/14/2016
Research Plan:	10/14/2016-10/31/2016
Forms	
Title, Purpose, Problem, & Hypothesis	_____
Experiment:	10/31/2016-11/21/2016
Materials	
Procedure	_____
Perform Experiment	_____
Additional Experiment if Necessary	_____
Write Observation in Data Notebook	_____
Results:	11/21/2016-12/12/2016
Prepare Charts, Graphs, etc.	_____
Completed & Submitted to Teacher	_____
Draw Conclusion	_____
Write Report:	12/12/2016-1/13/2017
Rough Draft	_____
Final Draft	_____
Abstract Completed & Submitted to Teacher	1/13/20117
Project Completed & Submitted to Teacher	1/13/2017
Exhibit Set Up Date/ **View by School**	1/17//2017 / **1/19/2017**
AGAPÉ JR. ACADEMY SCIENCE FAIR	**1/25/2017**

Parent Signature: _____

BACKGROUND RESEARCH

Now it is time to learn everything you can about your topic. Narrow down your subject area into a "testable question" that you can begin researching. Read anything you can find in books, magazines, newspapers, and on the internet. Make sure your information is current and reliable. Write to companies or professionals in the field for additional information.

Take careful and accurate notes and keep track of all bibliographic information on your sources and references. Use a variety of resources for information; do not limit yourself to only encyclopedias. Your background research should be 2-3 written pages. It should be written in blue or black ink, or typed.

Students should follow the "Big Six" information gathering process to do research for their science fair projects.

1. Task Definition
    a. What am I supposed to do?
    b. What are the possible topics?
    c. What makes a good science fair project?

2. Information Seeking Strategies
    a. What are the possible sources of information I can use?
    b. What are the best sources for the assignment?
    c. Have I used a variety of resources?

3. Location and Access
    a. Where do I find these sources?
    b. Do I know how to use the internet?

4. Uses of Information
    a. How will I record the information?
    b. How will I evaluate the information?

5. Synthesis
    a. How this information is best presented?
    b. How will I credit my sources?

6. Evaluation
    a. Was the finished product *effective*?
    b. Was the process used *efficient*?

PURPOSE

The purpose explains your goal and it may be one or more sentences. It should tell what the objective of your experiment is and what you are hoping to discover in your research. Explain why you decided to do this particular science project and why this topic was of interest to you.

PROBLEM

The problem is the scientific question that you are trying to find an answer to by doing an experiment and research. Write your problem in the form of an open ended question that can be solved experimentally. Remember to limit your problem and ask a specific question that is testable.

HYPOTHESIS

A hypothesis is an educated guess about an answer to a problem based on knowledge and research. It is written as a statement and should be written in measurable terms whenever possible. The hypothesis is written from past experiences or observations and from research you have read. It is written before the project experimentation and you do not change it once the experimentation begins.

PROJECT EXPERIMENTATION

In this part of the project the student must plan out an experiment that will test the hypothesis. A good science experiment limits the variables and has a control group. Scientists have to be very organized and precise so they list out all their materials and equipment ahead of time. They write out exact instructions to follow to perform their experiment. They keep complete and accurate data during the entire experiment.

Independent Variable - the variable you purposely change (Cause) Experimental Group

Dependent Variable - the variable that is being observed, which changes in response to the independent variable (Effect).

Constant Variables - the variables that are not changed, these must be kept the same for the test to be fair.

Control - the part of the experiment that does not receive the independent variable (Normal group.)

Scientists have experimental groups and control groups so they can compare their data. They have a large number of subjects to test so they can collect more data. It is best to perform the experiment several times to verify the results.

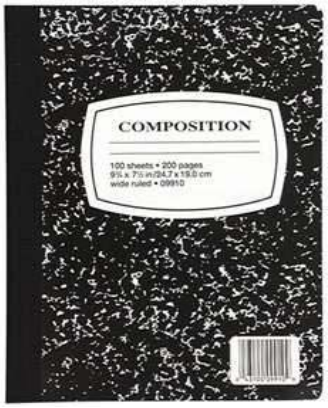
MATERIALS

This is a complete list of all materials and equipment that will be used. This list must include everything that is discussed in the procedure. Be detailed and exact in your list. Give the quantity, size, color, model, age, or other appropriate characteristics of each item. If you are using an unusual material, you may want to describe where or how it was obtained. If your equipment is dangerous, you should describe the appropriate cautions that should be taken while using it. If you are assembling equipment or apparatus, you may want to include labeled diagrams and/or directions. Remember to put all measurements in metrics.

OBSERVATIONS/ DATA/ RESULTS

Data Notebook

A data notebook is very much like a diary because it is the place where a scientist will record daily observations and results. The data notebook is a workbook that is used while an experiment is in progress. It is not meant to be especially clean or polished. Sometimes a scientist may spill something on it or may have to scratch out a mistake or an incorrect entry. This is acceptable because the information in the data notebook will eventually be transferred to a formal report.



You will need to develop your own data notebook. A journal, composition book, or spiral notebook is generally used for this purpose. Write the title of you experiment on the first page of your notebook. Be sure to **date** each entry in your data notebook. Describe what you are doing in a very clear, detailed manner. Record any problems that you encounter or any observations that you make. Draw diagrams or take photographs.

Your journal should contain data, measurements, and written notes about what you are observing (hearing, seeing, touching, etc) about your experiment. **Be sure to use metric measurements.**

ANALYSIS

This is a summary of your observations, data and results. It summarizes what your data has shown you. Neatly compile your data into tables, charts, or graphs if possible. It is a good idea to have a descriptive paragraph to accompany each figure.

CONCLUSION

The conclusion is a summary of the results of the science fair project. In the conclusion tell whether the results supported the hypothesis. Tell exactly what happened during the experiment and why you think it happened. Discuss any problems you encountered during your experimentation and any discoveries you made during the process. What value do you think this project has and what recommendations would you make if you were going to study it further?

GLOSSARY

The glossary section should include definitions for any vocabulary words that you used in your paper that were new to you or that you think might be confusing to anybody who would be reading your research paper?

APPLICATIONS

The applications section should address how this project relates to current issues or real life problems. This section should explain how these results might potentially be used to make the world a better place to live. Frequently a science project might not have a direct application to real-life problems. However, with a little creative thought, all projects can be indirectly related to something that is a current issue and affects mankind.

RECOMMENDATIONS

The recommendations sections should describe how your science project might be improved if it were to be repeated in the future. Include ideas about hour your experiment might be expanded, how your hypothesis might be tested differently, or maybe a new variable applied. The recommendation section should also include a description of any problems that you encountered during the experiment and how they might be avoided next time.
Many students feel awkward criticizing their own work. Try to remember that no experiment is without flaw. All experiments have variables that couldn't be controlled. Real scientists include a recommendation section in their research too. We have to learn from our mistakes.

BIBLIOGRAPHY

The bibliography should be a complete list of every source of information you used to complete this project. These should be listed in alphabetical order and have complete bibliographical information.

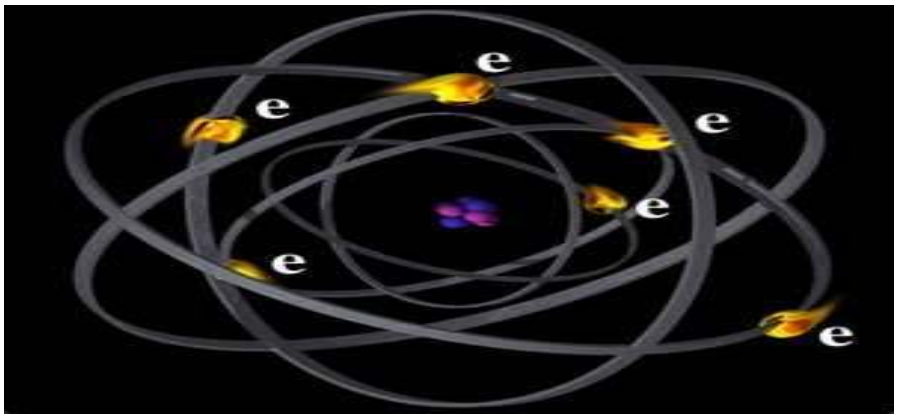
ABSTRACT

The purpose of the abstract is to provide a 250 word summary of all the important sections of the research report. **It includes the purpose, the procedures, the data and the conclusions.** During the science fair, the judges will frequently begin the judging process by reading all the abstracts in a particular category. It is important that an abstract be well constructed. Please follow the guidelines given for writing the abstract and write it on the official form.

http://www.georgiacenter.uga.edu/sites/default/files/Abstract-and-Instructions.pdf

ORAL PRESENTATION

You will be required to present your science fair project to your classmates. You will be graded on all parts of your research project: the data notebook, the research paper, the display board, the abstract, and the oral presentation.



There are important forms for each student to submit along with their note book. They are found on the ling below. Please review each form and complete the appropriate one that applies to you. You will have guidance from your teacher so that you complete the appropriate form(s).

http://www.georgiacenter.uga.edu/sites/default/files/gsef-forms-for-teachers-students.pdf

SCIENCE FAIR EVALUATION CRITERIA

A. Statements to be addressed under Creative Ability/Originality
    - There was a question asked
    - It was an original question and the answer was not known
    - The approach to answering the question was creative
    - The creativity of the study was within the creative ability of the student
    - The student used the scientific method in experimentation rather than only observations

B. Statements to be addressed under Scientific Thought
    - The scope of the study was within the student's ability
    - The study was well thought out and showed initiative in thought and design
    - The goals and objectives of the study were well defined
    - The scientific literature was developed for this study
    - A logical hypothesis was developed for this study
    - The data collected relates to the hypothesis

C. Statements to be addressed under Thoroughness
    - The student collected all data available
    - The student identified all controls
    - The sample sizes and population sources were carefully chosen
    - The variable of each experiment was clearly defined
    - Replications and duplications were used
    - The student anticipated the problems encountered
    - The student related the work to that reported in the literature
    - The data was collected in quantitative units
    - Several experiments were done, not just one
    - The study was completed or brought to a logical stopping place
    - The data was thoroughly analyzed

D. Statements to be addressed under Skill
    - The experiments protocols were handled with skill
    - The experiments were designed with care and anticipation
    - The data measurements were done precisely, the study was skillfully designed, and was not too complicated
    - Technical problems were overcome and not merely avoided
    - A detailed notebook and log were kept
    - This study was the student's alone and excessive help was not utilized

E. Statements to be addressed under Clarity
   - The student is able to explain
   - The student clearly understands the research
   - The student understands the meaning of the results obtained
   - The student understands where this research can lead in the future
   - The student understands how this study can be improved
   - It is clear to the student whether the data supports or fails to support the hypothesis
   - Is the display well organized so that the component parts of the presentation are logical?
   - Is it neat and uncluttered or are there items that are not part of the science or relevant to the study performed?
   - Does the display stand alone? Can you understand the study without the student present?
   - Does the display communicate science or just an exercise in artistry?

F. Statements to be addressed under Teamwork (only for Team Projects)
   - The tasks and contributions of each team member are clearly outlined
   - Each team member was fully involved in the project
   - Each team member was familiar with all aspects of the project
   - The final work reflects the coordinated efforts of all team members

HELPFUL WEBSITES

http://www.ipl.org/youth/projectguide
http://www.chem4kids.com
http://www.sciserv.org/isef

FAIR RESOURCES

Finding Science Reagents
http://www.scifair.org

The Ultimate Science Fair Resource
http://sciencepage.org/scifair.htm

PROJECT IDEAS

http://sciencefairproject.virtualave.net/
http://www.cmste.uregina.ca/scifair.html
http://www.sciencebob.com/lab/sciencefair/resources.html
http://www.yahooligans.com/science_and_nature/experiments_and_activities/science_fairs/

SCIENCE FAIR SAMPLE JUDGING SHEET

http://sciencefairproject.virtualave.net

SCIENCE FAIR HOMEPAGE

http://istf.ucf.edu
http://www.drexel.edu/dvsf/

PRESENTATION AND EVALUATION

OTHERS
http://www.sciencedaily.com
http://www.enn.com
http://www.newscientist.com
http://www.eskimo.com/~billb/amasci.html
http://www.ontariosciencecenter.ca/kids/cool_stuff/fairlinks.asp
http://homeworkspot.com/sciencefair

SAMPLE QUESTION ASKED BY JUDGES

- What is the purpose of your project? Describe the problem.
- Explain your procedure.
- Where did you get the idea for your project?
- What is your control? Variable?
- What instruments did you use for measurement?
- Did you repeat your test? How many times?
- On what data did you base your conclusion?
- What problems arose during your investigation? How did you overcome them?
- Are there any other approaches you might have taken to your research?
- What is the value of your project?
- Do your results indicate further investigation of this idea is needed?
- What would you do differently if you could do this project again?

STUDENT SCIENCE FAIR CHECKLIST

Student: _____

Teacher: _____

Project Title: _____

Components after IRB* Approval Teacher & Safety Certification	Due Date	Date Completed	Parent Initials	Teacher Initials
1. Topic Selection				
2. Background Information				
3. Problem Statement				
4. Hypothesis Information				
5. Materials List (experiment)				
6. Procedures (experiment)				
7. Conduction of Experiment & Collection of Data				
8. Completion of Lab Log				
9. Data Analysis (Result)				
10. Conclusions				
11. Potential Applications				
12. Development of Abstract				
13. Bibliography				
14. Display Plan				
15. Construction of Display				
16. Classroom Presentation				
17. Suggested Improvements				

***Institutional Review Board**

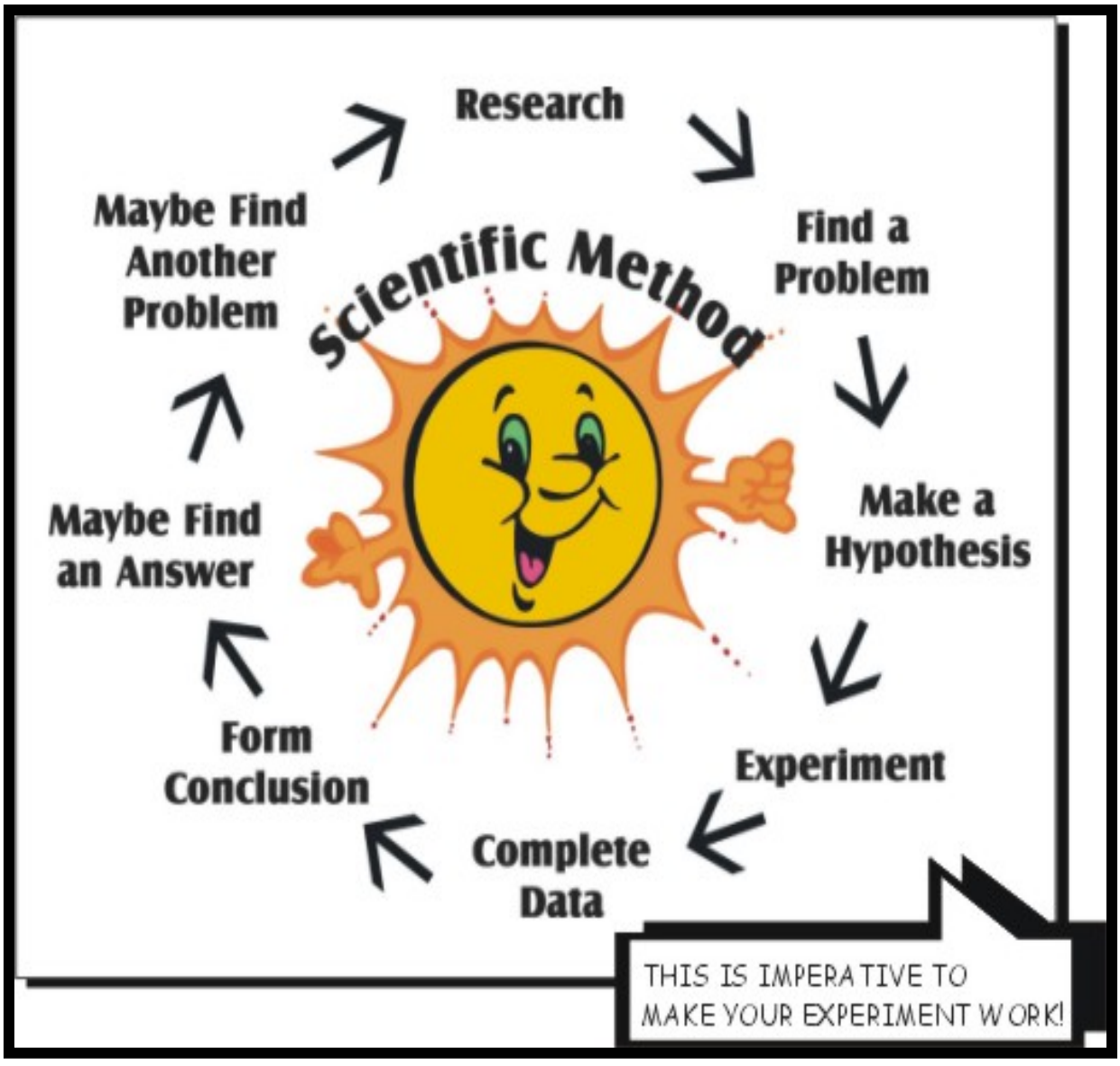
Comments:

_____

_____

_____

THE SCIENCE FAIR METHOD



LOG BOOKS

- Log books are very important.
- Log books can fill in missing information.
- Log books are critical to understanding the implementation of the scientific method.

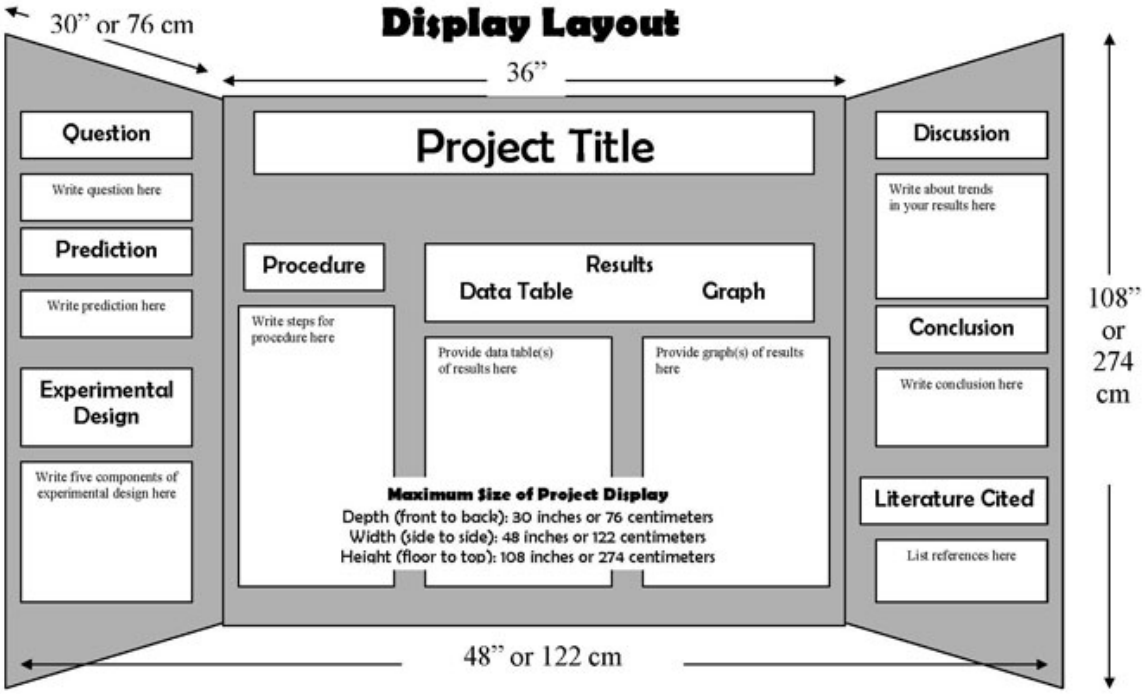
VISUAL DISPLAY

A visual display must accompany your written report. It must be made of sturdy material that can stand by itself. It cannot be larger than the following dimensions:

- 30 inches (76 cm) deep
- 48 inches (122cm) wide
- 108 inches (274cm) high from the floor to the top of the project. (They are usually set on tables that are about 36 inches or 91cm off the floor)

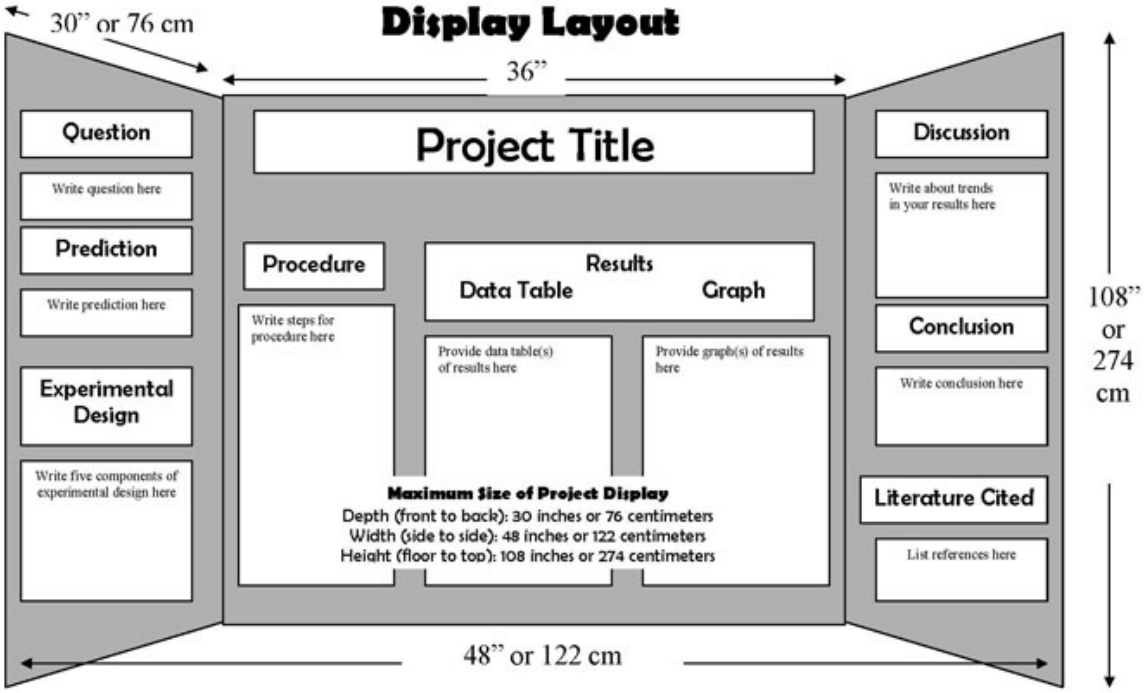
Make your display attractive and informative. Make it interesting and eye catching – but don't get to cutesy. It is a science fair project- not a scrapbook project.

Make the most of your space. Use colors that are easy on the eyes and choose a lettering style that is easy to read. Make sure that everything you put on your display is spelled correctly. Note: Before attaching anything to the backboard, place you board flat on the floor and lay out all the parts. Make sure you have room for everything before you start permanently attaching them. A diagram of a backboard is available below on page 20. Please refer to this for the proper layout.



PROJECT DISPLAY BOARD

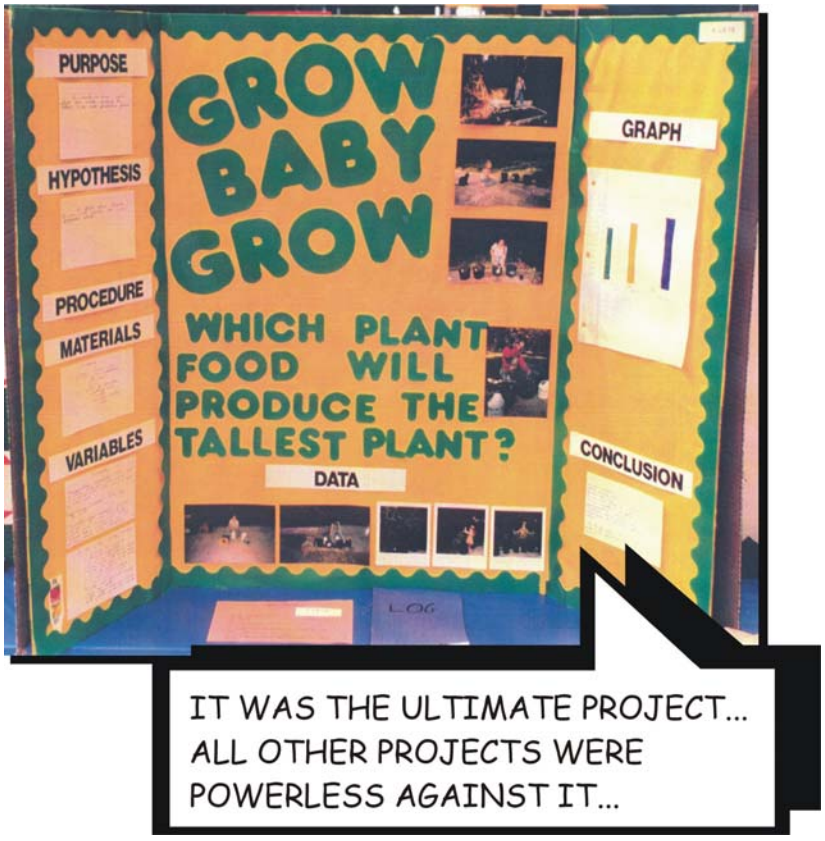
LAYOUT



If you have questions or concerns ask your teacher for guidance.

COMMUNICATION

Clear, Concise, Complete, Catchy



Display Board Sections

- Purpose
- Hypothesis
- Procedure:
  - Materials
  - Variables
  - Data collection
  - Data analysis (graphs)

- Conclusion