CHICAGO PUBLIC SCHOOLS STUDENT SCIENCE FAIR

Science Project Guide for Parents: *Knowing Your Role*

Introduction

The purpose of this booklet is to help parents to know their role in supporting their child's involvement in preparing a science project as opposed to doing the project for the child.

The following pages include the text of the Illinois Goals for Learning that apply to the four core subject areas: Language Arts, Mathematics, Science, and Social Science as identified by the state of Illinois. Incorporated in the standards is a strong focus on cultural diversity, critical thinking, problem solving, and decision-making skills considered as valued expectations for learning.

Why Do a Science Fair Project?

A science fair project is a well-planned set of activities involving research and experimentation to test a hypothesis. It offers students the opportunity to excel in reading, writing, speaking, listening, mathematics, science, and the social sciences by providing the chance to:

- Learn and use the scientific method.
- Learn organizational skills.
- Learn problem-solving skills.
- Improve process skills.
- Discover several solutions to problems.
- Build self-image and improve self-esteem.
- Implement technology.
- Practice library research.

Inquiry skills learned through the development of a science project will become habits that can be used throughout a lifetime

Helping Your Child with His or Her Science Project

Ways a parent may help:

1. Realize that the purpose of a science fair project is to use and strengthen the basic skills the child has learned and to develop higher-level thinking skills.
2. Help your child understand that science is not just a subject but a *way of looking at the world around us.*
3. Make sure your child feels it is his or her project. Make sure the project is primarily the work of the child. Make sure he or she stays focused.
4. Realize that your child may need help in understanding, acquiring, and using the major science process skills (researching, organizing, measuring, calculating, reporting, demonstrating, experimenting, collecting, constructing, and presenting).
5. Realize that your child may be using reading, writing, mathematics, and social science skills in a creative way to solve a problem, for the first time.

6. Realize the teacher works with 30 or more students, and this may make it difficult for him or her to give a large amount of individual attention to your child.
7. Help your child understand that a weekend chore, or one or two posters, is not a project.
8. Realize that a good project does not have to cost a lot of money.
9. Purchase or help your child find the necessary materials to complete a project.
10. Find an area in the house where your child can work without concern about pets or brothers or sisters destroying the work.
11. Work with your child to find a mutually agreed upon schedule, to prevent a last minute project. A 4- to 8-week plan is best.

The following steps should be on your schedule:

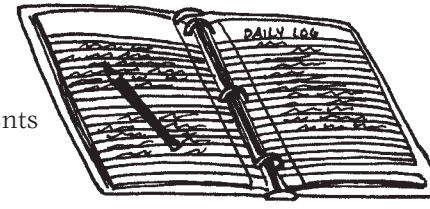
- Find a topic that interests your child.
- Narrow the topic to a specific problem that is appropriate to the child's ability level.
- Research what is already known about the topic.
- Follow the Scientific Method as described on page 5.
- Create the exhibit.
- Present the project.

Library Research

The library research section of the science fair project is a collection of all information pertinent to your child's investigation. References may come from a variety of sources and should be current (copyright date of 1995 or more recent). Primary research should include published articles, books, journals, Websites, and periodicals. Primary research may also include interviews with authorities. Regional libraries have access to Websites on the Internet; however, these should be secondary and not the only sources cited. This library research becomes the **Review of Literature.**

The science fair project requires a **Research Document.** The **Research Document** includes the **Abstract, Safety Sheet,** any necessary **Endorsements,** and a **Research Summary.**

The **Research Summary** includes the following:



- Title page
- Table of Contents
- Acknowledgments
- Purpose and Hypothesis
- Review of Literature
- Materials and Methods
- Results
- Conclusion
- References – **DO NOT** refer to this section as a bibliography

***Note…** All Chicago Public Library branches have a copy of the current *Student Science Fair Handbook* to help guide the students. They should also be available at each school.

Check with your child's teacher, librarian, or Principal.

The Science Experiment

A student record sheet of the components of a science experiment

1 QUESTION/PROBLEM

What is the question/problem you are trying to investigate?

2 HYPOTHESIS

What do you think is the answer to the question/problem?

3 MATERIALS

What are the things you will need to conduct the experiment?

a.
b.
c.
d.
e.
f.

4 PROCEDURE

What steps will you follow to conduct the experiment?

a.
b.
c.
d.
e.
f.

5 RESULTS

What happened?

6 CONCLUSION

What is the answer to the question/problem?

Kinds of Science Fair Projects

What students learn from each

Kind of Project	Example	What Students Learn (skills)
Model Building	Solar system Volcano The ear	Observing Researching Constructing a model Designing a display
Hobby/Collection	Sea shells Rocks Model cars	Observing Researching Classifying Designing a display
Demonstration	Science magic tricks Paper making Electric circuit	Observing Researching Manipulating materials Designing a display
Report and/or Poster	Human body Fossils Dinosaurs Birds	Observing Researching Writing Designing a display
Investigation	**Do butterflies prefer sugar or artificial sweeteners?** **How do plants react to different fertilizers?**	**Observing** **Measuring** **Predicting** **Inferring** **Classifying** **Identifying controls and variables** **Graphing** **Constructing data tables** **Experimenting** **Researching** **Writing a scientific paper** **Designing a display** **Public speaking**

Categories

Aerospace Science

Behavioral Science

Biochemistry

Botany

Chemistry

Computer Science

Earth Science

Electronics

Engineering

Environmental Science

Health Science

Material Science

Mathematics

Microbiology

Physics

Zoology

For further descriptions of these categories, consult the science fair Website or *Student Handbook or website - www.chicagostudentsciencefair.org.*

Safety Considerations

Glassware

Chemicals

Hazardous Materials

Fire Hazards

Radiation Hazards

Production of Alcohol

Lasers

Ultraviolet Light Sources

Biological Hazards

Electrical Hazards

Mechanical Hazards

Warning: Your child's project may be disqualified for violations of safety guidelines.
Make sure that he or she abides by all the rules and regulations, especially those dealing with animal experimentation.

Tips about Conducting Experiments

Control Groups vs Experimental Groups

Control Group: A study group that is used for comparison

Experimental Groups: Those that have something done to them. The "something" is a variable.

Independent Variable: The experimenter changes something to observe what will happen. The "thing" that is changed is the independent variable.

Dependent Variable: The experiment changes something to observe what will happen. These "things" that were changed may cause something else to happen. The "something else" is the dependent variable.

An Example of a Controlled Experiment

To conduct a scientific investigation, care must be taken to follow the scientific method. Your child must design an experiment to test his/her hypothesis. When planning an experiment, your child must remember to keep everything the same except for the single variable being tested. A *variable* is something that can be changed in the experiment. It is what the child is testing. Everything else must be the same, and only one variable or condition should be altered or changed at a time. 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 tested by the other groups.

Here is an example:

Purpose: How does the amount of fertilizer used affect plant growth?

Hypothesis: Increased dosages of fertilizer will cause greater growth in tomato plants because…

Materials:

Tomato seeds	Water
Soil	Fertilizer
Cups	

Procedure:

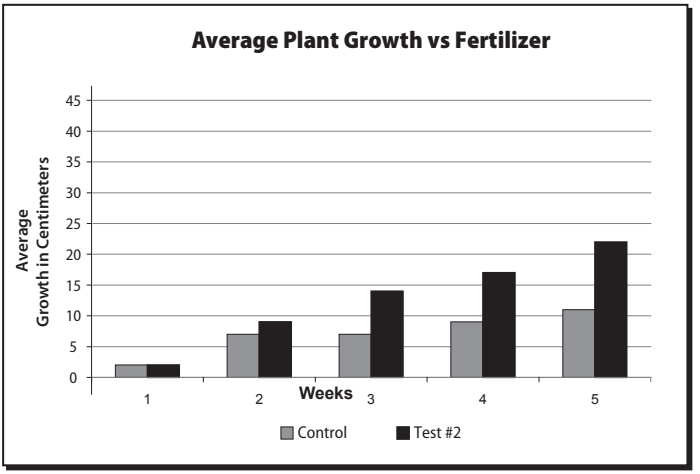
1. Take all seeds from the same package and select them randomly.
2. Plant all seeds in the same size pots with similar soil (measured in grams).
3. Provide for all plants the same amount of light and water (measured in milliliters).
4. Be sure the temperature is the same for all plants.
5. Use more than one plant in each test group.
6. Set up one group as a control group. Do not give this group fertilizer.
7. Set up two other test groups. Give one a determined

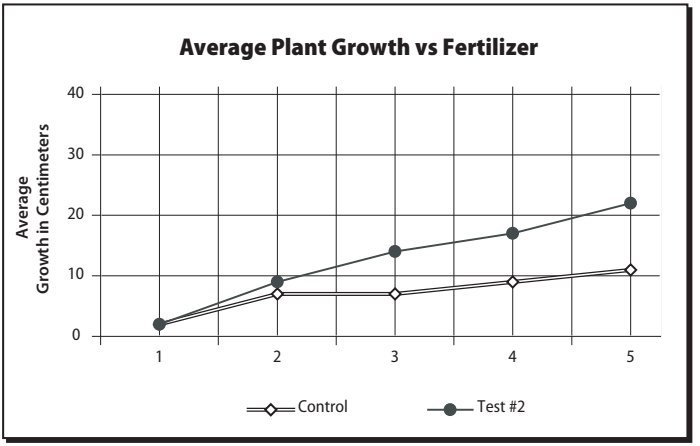
amount of fertilizer each week. Give twice as much fertilizer to the other group.

8. Measure in centimeters the length of the stems.
9. Record all observations. These are the data.
10. Arrange data in the form of a log, table, chart, and/or graph.
11. Draw a conclusion from this data.

For step by step instructions on how to construct charts and graphs, go to the following website:
http://nees.ed.gov/nceskids/graphing

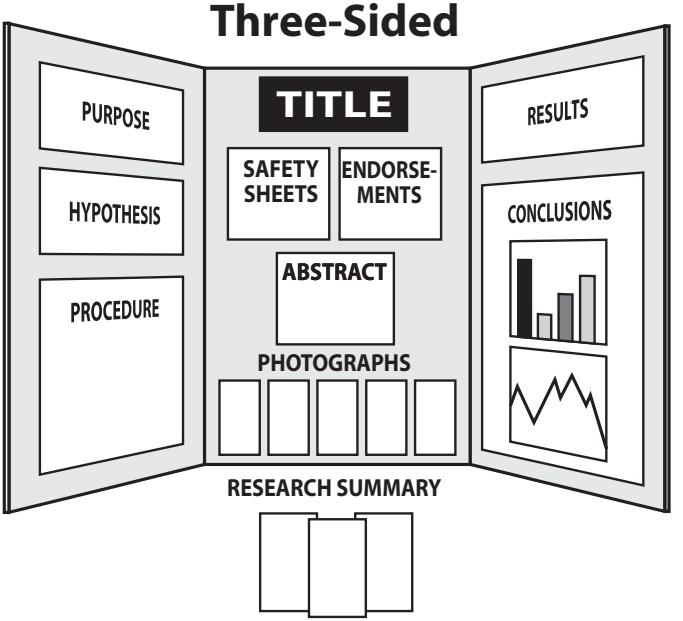
Controlled Experiment Results		
Week	Average Growth of Control	Average Growth of Test # 2
1	2	2
2	7	9
3	7	14
4	9	17
5	11	22



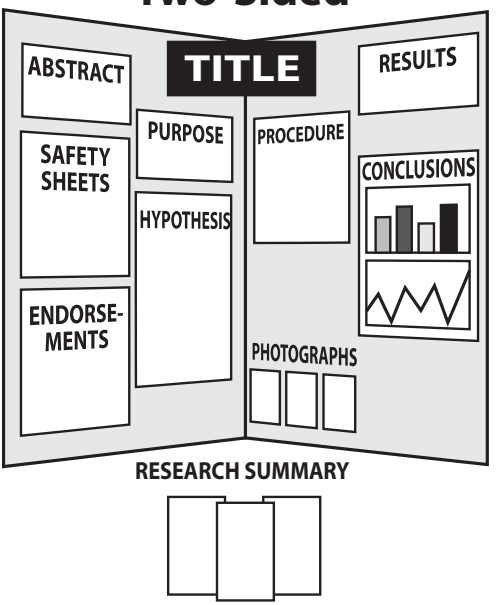


Science Fair Display Boards

Three-Sided



Two-Sided



A Successful Science Fair Project

Below is a list of points that can be used to evaluate a science fair project. The science project:

- Represents the work of the student, not that of an expert or parent.
- Indicates a complete understanding of the science area chosen.
- Shows careful planning that would eliminate a **rushed** job**.**
- Shows ingenuity in collecting materials, and keeping the cost to a minimum.
- Has a certain amount of originality with regard to the approach.
- Includes a controlled experiment with only one manipulated variable.
- Has a conclusion drawn from repeated experimentation.
- Has accurate, valid, and correct observations.
- Shows the use of the metric system for measurement.
- Shows that safety measures have been taken.
- Gives credit to those who gave help.

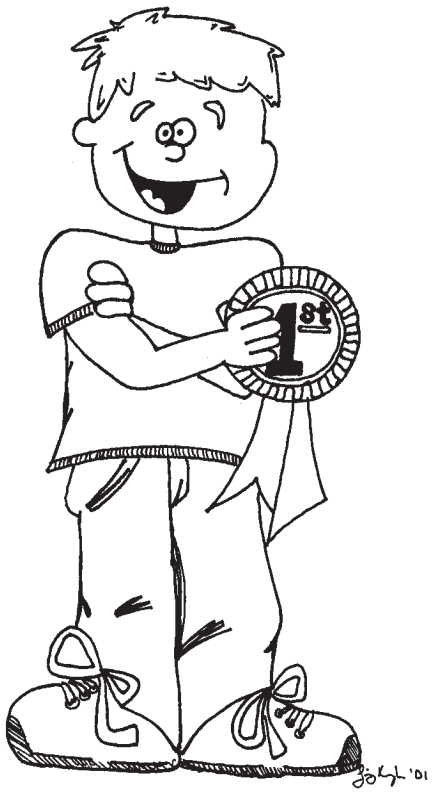
Below is a list of points that can be considered when evaluating a science fair display board. The display board:

- Has a sturdy backboard that will stand by itself.
- Meets the measurement requirements for height, depth, and width.
- Has a simple, well-stated title and neat lettering.
- Includes the Scientific Method.
- Includes photographs, charts, graphs, etc.
- Tells a complete story with the problem and solution of the problem serving as the theme.
- Represents the **best** of the student's ability.

Even if a project does not meet the requirements of each of the points, it can be considered a success if new facts or skills are learned. A successful project is simply a learning situation where accomplishing a goal is a pleasant and useful experience.

A Science Fair Project is NOT:

- Only a report.
- Necessarily a new discovery or an original piece of research.
- A plastic model.
- An enlarged model or drawing.
- A weekend chore.
- One, two, or even three posters.
- Something done by a parent or teacher. Even if a project does not meet the requirements of each of the points, it can be considered a success if new facts or skills are learned. A successful project is simply a learning situation where accomplishing a goal is a pleasant and useful experience.



Important Things the Judges Look For:

- The reason for choosing the topic
- The reason for the hypothesis (Why did they think so?)
- The number of trials done
- Quantitative results (measurements) as opposed to qualitative results (based on how it looks)
- Measurement in metrics
- Data recorded regularly in a daily log
- Results presented in a table, chart, or graph
- Results related to the hypothesis
- Conclusion related to the question or problem
- Research written in your child's own words or paraphrased
- Research cited if copied from an author (anything not cited is plagiarism)
- Photographs depicting the steps of the experiment as it progresses (include the child in the photos wherever possible)
- Honest answers to questions

*__Remember...__ A *Student Science Fair Handbook* is available for all students to use at their school or at a Chicago Public Library.

Also...the Website is:
www.chicagostudentsciencefair.org

Metric Measurements

Kitchen measurements

1 cup	236 milliliters
1/2 cup	118 milliliters
1/3 cup	79 milliliters
1/4 cup	59 milliliters
1 Tablespoon	15 milliliters
1/2 Tablespoon	7 milliliters
1 teaspoon	5 milliliters
1/2 teaspoon	2.5 milliliters
1/ 4 teaspoon	1.25 milliliters
1/8 teaspoon	0.62 milliliters

Weights

1 ounce	28.35 grams
1 pound	7.737grams

Linear measure

1 inch	2.54 centimeters
1 foot	30.48 centimeters
1 yard	0.9144 meter
1 mile	1.6093 kilometers

Measure of volume

1 quart liquid	0.9463 liter
1 gallon	3.852 liters

Measure of temperature

▼ Fahrenheit	▼ Celsius
Freezing 32 degrees	0 degrees
Room temp. 72 degrees	21 degrees
Boiling Point 212 degrees	100 degrees

Use a F/C thermometer for all increments in between.

Notes

Compiled and prepared by Gloria M. Dobry
March 2004
Published by the Chicago Public Schools
Student Science Fair, Inc.
P.O. Box 29546
Chicago, IL. 60608