Garden Oaks Elementary School

2010-11 Science Fair Handbook

The purpose of this publication is to provide students and parents with guidelines to participate in the Garden Oaks Elementary Science Fair.

For more information, please contact Susan Morris, Science Fair Coordinator, at smorris3@houstonisd.org or stop by Room 14.

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WHAT IS A SCIENCE PROJECT?

A science project is a planned undertaking by students, calling for problem-based constructive thought and research following the experimental design process.

A helpful resource for working through this process can be found at:
http://dept.houstonisd.org/curriculum/science/Content/design.pdf

EXPERIMENTAL DESIGN PROCESS

1. **Question** - What is the goal? What is tested? (e.g. Does temperature affect the time it takes ice to melt?)

2. **Variables** -There are two variables that need to be identified. An independent variable is the one thing that is purposefully changed to affect the result. (e.g. air temperature)The dependent variable is what is measured. (e.g. Time it takes for the ice to melt.)

3. **Hypothesis** - Make a prediction about how the variable will affect what the answer to the problem will be. The hypothesis must answer the question. This should be stated as an "**If….then**" statement and be in measurable terms.

4. **Project Plan/Procedure** - Write a step-by-step description of how the experiment will be conducted in order to test the hypothesis. Include repeated (at least 3) trials to increase the reliability of results.

5. **Materials** - List all materials and equipment that were used.

6. **Data Gathering** - Keep a detailed journal including dated entries. Organize observations called data on graphs, charts, and tables using metric measurements. Photographs are appropriate but **cannot show faces** of individuals.

7. **Results** - Summarize the results of the investigation.

8. **Research/Bibliography** - Find more information related to the question. Use print material, electronic media or interview with experts. The bibliography should have a minimum of three (3) sources. These include books, journals (including electronic journals) and magazines. Cite sources using correct format.

9. **Conclusions** - Answer the problem statement. Then analyze the results and write a conclusion explaining whether the hypothesis was proven or not. If you repeated your project what would you change?)

10. **Communicate Findings** - Present the project.

General Guidelines

Timetable:

Week of November 22, 2010 - Guidelines distributed to students

November 29-December 10, 2010 - Proposals submitted to classroom teachers for approval

December 15, 2010 - final proposals submitted by teachers to Ms. Morris

January 18, 2011 - Projects due

January 19-25, 2011 - Projects judged by teachers

January 27, 2011 - Family Science Fair Expo

Projects

All projects must be experiments. There will be no demonstrations, models, surveys or reports. See the description of the experimental design process on page 2 and the example project on p. 20. Complete the project proposal form (p. 23) and turn it in to your classroom teacher. Your teacher must approve the plan before you begin your project. Proposals may be turned in to your classroom teacher any time on or before December 10, 2010. Final, classroom teacher-approved proposals are due to Ms. Morris on December 15, 2008.

Log/Journal

All exhibits must be accompanied by a log or journal. This does not have to be a marble composition notebook. A folder with notebook paper inside will do nicely. The log should contain raw data, procedure, observations and reflections that were recorded during the experimental process. **All entries should be dated**. These are the working notes of the scientist as the experiment is being done. A student's name should NOT appear anywhere on the log or journal.

Exhibit
It is suggested that exhibits be confined to a space not to exceed 76 cm (30 inches) deep, front to back; 60 cm (24 inches) wide, side to side; and 274 cm (108 inches) high, floor to top. The maximum height for the display itself is 198 cm (80 inches.) This is a typical tri-fold display board.

Categories
Projects should fall into one of the following 3 categories of the Elementary Science Curriculum.

Physical Science
(Chemistry, Physics, Properties of Matter)

Earth / Space Science
(Geology, Astronomy, Geography)

Life Science
(Plants and Animals)

Type of projects by grade level

Grade Level	Class Project	Group of 3 students	Group of 2 students	Individual
PK – 1st	X			
2nd	X	X	X	
3rd -6th		X	X	X

Project Requirements

Each class/individual/group should develop a project plan **before** the project is started. The plan must be written on the form found on page 23. The completed form must be turned in to the classroom teacher by December 10, 2010 for prior approval. This same form will be used as an entry form for the school science fair. This form must be submitted to Ms. Morris by the classroom teacher by Dec. 15, 2010.

All projects need to be conducted under adult supervision and follow elementary safety guidelines. TEA Elementary Science Guidelines can be found here:
http://www.utdanacenter.org/sciencetoolkit/downloads/safety/texas_safety/introduction.pdf

Materials and equipment should be common elementary science resources such as: aluminum foil, plastic bags, baking soda, salt, potting soil, sugar, vinegar, coffee cans with lids, etc.

Projects involving cell cultures, bacteria or mold and those using dangerous chemicals are not appropriate for this age group and should not be permitted. Human surveys do not readily fit into an experimental design and therefore are not accepted.

Approval will not be given for projects where the intent is to kill a living organism.

The project must be the work of the student(s) registered for the fair.

A laboratory notebook, log, or journal is required for each project. This should include raw data, procedures, observations and reflections that were recorded during the experimental process.

Age appropriate research should be conducted to increase understanding of science concepts covered in students' projects. A brief summary of the research can be included separately or integrated into the project conclusion.

Students must demonstrate through pictures, charts, graphs, diagrams, or tables on the project board or folder evidence of the experiment's completion. **Remember:** Photographs should not show students' faces.

All exhibits should have a freestanding backdrop. No commercial models or kits should be allowed as exhibits. A copy of the bibliography should be attached to the backdrop.

Only the project board, log and pictures may be exhibited at the fair. The name of the class, student(s), and/or school must **NOT** appear on the project.

Helpful Websites

http://school.discoveryeducation.com/sciencefaircentral/

www.eskimo.com/~billb/scifair/bio.html#simp

www.theteachersguide.com/QuickScienceActivities.html

http://www.sciencebuddies.org/

http://www.scifair.org/studentideaexchange.html

http://www.all-science-fair-projects.com/

The Science Fair Logbook

The Science Fair LOGBOOK is the most important component of your science fair project. The handwritten LOGBOOK is a daily diary of ALL project activities from start to finish. The rule to a complete and valid LOGBOOK is "*ALWAYS WRITE EVERYTHING YOU DO IN YOUR LOGBOOK*". Please note you CANNOT use whiteout nor can you have pen/pencil scratch-outs in the logbook. If you are writing in your logbook with a pen and you make a mistake or you need to make a correction, line through the mistake, and rewrite what you intended to write above the mistake or correction.

EXAMPLE: **black (write correction over the corrected word)**
The horse is ~~blck~~ and white.

The logbook must be neatly done. NO EXCEPTIONS
To help you prepare your LOGBOOK correctly please use this checklist.

What Should be in the Science Fair Logbook? *(these pg. #'s are suggestions)*	**Need to Complete**	**Completed**
1. Project Title on the Front Cover (DO NOT write your name)		
2. Project Title on the 1st Sheet of the Logbook		
3. Table of Content with Page Numbers (start on pg.2)		
4. Handwritten Introduction (of Project in abstract format) pg.3		
5. Hand Write Your Problem Statement in the form of a Question (pg. 4)		
6. Hand Write Your Research Information (pages 5-8)		
7. Hand Write Your Hypothesis (p.9) "If…then…because…"		
8. Hand Write a List of All Materials (p.9)		
9. Hand Write a List of the Procedures of this investigation (p.10)		
10. Hand Write Variables – List all INDEPENDENT Variables, and all DEPENDENT Variables (p.11)		
11. DRAW your Data Charts and Graphs – On this page you must show where you tested your data Three -five times. (METRIC UNITS ONLY!) Trial 1 , Trial 2, Trial 3, Trial 4, Trial 5 (p.12 -13)		
12. Hand Written Results (p.14)		
13. Hand write the Conclusion - Was your hypothesis supported or not supported, How can you change this experiment if you had to redo the investigation? (p.15)		
14. Hand write a list of your 3 Bibliographies – NO ENCYCLOPEDIAS (p.16) (use www.easybib.com)		
15. A Sketch of Your Science Fair Backboard (p.17)		
16. Pictures of your experiment neatly pasted in your LOGBOOK (DO NOT show ANY faces in the pictures) (p.18-21)		
17. A Section in the LOGBOOK documenting your Day-by-Day activities with dates such as…… 08/28/09 – I decided to participate in the school science fair. 09/20/09 – I completed my science fair commitment form 09/23/09– I turned in my science fair commitment form to (teacher).		

Step 1: Coming up with a Good Question…

Now that you have picked out a topic that you like and that you are interested in, it's time to write a question or identify a problem within that topic. To give you an idea of what we mean you can start off by filling in the question blanks with the following list of words:

The Effect Question:

What is the effect of _____ on _____?

sunlight	**decomposing rates**
eye color	**pupil dilation**
tenderizing methods	**a piece of meat**
temperature	**the size of a balloon**
oil	**the surface of a ramp**

The How Does Affect Question:

How does the _____ affect _____?

color of light	**the growth of plants**
humidity	**the growth of fungi**
color of a material	**its absorption of heat**

The Which/What and Verb Question

Which/What _____ (verb) _____?

Lego robot	**is**	**the strongest lever**
Shape of ice	**melts**	**slowest**
Glass block	**is**	**most energy efficient**
oil spill cleanup	**is**	**fastest**
paper	**flies**	**paper airplanes farthest**

Now it's your turn:

Create your Science Fair question using either the "Effect Question", the "How does Affect Question" or the "Which/What and Verb Question":

_____
_____
_____
_____
_____
_____

Step 2: Doing the Research on your Topic And Writing the Bibliography

So you've picked your category and you've chosen a topic. You even wrote a question using our cool fill in the blank template. Now it is time to research your problem as much as possible. Becoming an expert at your topic is what real scientists do in real labs. **So, how do you become an expert?**

YOU READ!!!! YOU READ!!!! YOU READ!!!! YOU READ!!!! YOU READ!!!!

READ about your topic. READ encyclopedias. READ magazine articles and books from the library. READ articles from the Internet. Take notes of any new science words you learn and use them. Keep track of all the books and articles you read. You'll need to make a list of every book, article and website that was used for research.

YOU DISCUSS!! YOU DISCUSS!! YOU DISCUSS!! YOU DISCUSS!!

Talk about it with your parents. Talk about it with your teachers. Talk about it with experts like Veterinarians, Doctors, Weathermen or others who work with the things you are studying. Sometimes websites will give you e-mail addresses to experts who can answer questions…. But again, do not write to anyone on the internet without letting an adult supervise it. (*hint: take pictures of yourself interviewing people)

Research: My problem statement is about this topic: _____
(sample topics could be *magnetism, electricity, buoyancy, absorbency, taste, plant growth, simple machine*) If you are having problems finding out what the topic is, ask your teacher or an adult to help you on this one….)

Write down 5-10 important points that you learned about your topic:

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Document your references by writing a Bibliography

A bibliography is a record of the references that you use to research your project. Use the following information to write down your source in the correct format. Remember to write down the bibliography information in alphabetical order.

Example of a BOOK in Bibliography Format:

Black, Susan. The Life of George Gaylord Simpson, New York: Broadway Press, 1999.

Books I used to research my topic are:

_____
_____
_____
_____
_____
_____

Example of a WEBSITE in Bibliography Format:

Andrew, Jim. Paleontologist. (Online) Available http://www.altavista.com , January 8, 2000.

Internet sites that I used to research on my topic are:

_____
_____
_____
_____
_____
_____

Example of a PERSONAL INTERVIEW in Bibliography Format:

Thomas, Lewis. Personal interview. March 10, 2008.

People I talked to about my topic are:

_____
_____
_____

Step 3: Writing the Hypothesis

Whew…..when you think that you can't possibly learn anymore and the information just keeps repeating itself. You are ready to…

Write a Hypothesis

Now it's time to PREDICT what you think will happen if you **TEST** your problem. This type of "SMART GUESS" or PREDICTION is what real scientists call **a HYPOTHESIS.** The hypothesis is based upon your research. A formalized hypothesis contains two variables. One is "independent" and the other is "dependent." The independent variable is the one you, the "scientist" change and the dependent variable is the one that you observe and/or measure the results.
The formalized hypothesis is written in the IF and THEN, BECAUSE format.

Suppose your PROBLEM STATEMENT was:

> How does a change in temperature affect the color of leaves?

This is how you write the formalized hypothesis:
Hypothesis:

> **3rd grade level:**
> **IF** leaf color change is **related** to temperature, **THEN** *exposing plants to low temperatures will result in changes in leaf color* **BECAUSE** the leaf is where plants make their food and plants need the energy of the Sun to make food.
>
> **5th grade level:**
> **IF** leaf color change is **related** to temperature, **THEN** *exposing plants to low temperatures will result in changes in leaf color* **BECAUSE** the leaf is where plants make their food and plants need the energy of the Sun to make food. When a plant makes food, the chlorophyll in the leaf of the plant keeps the leaf green. When a plant is exposed to LOW temperature this could mean the plant is not getting enough energy to make food. When the plant can not make food the leaf will change a color other than green.

(This hypothesis not only predicts what will happen in the experiment, but also shows that the "Scientist" used research to back up his prediction.)

Now it's your turn:

Rewrite your problem statement and create a Hypothesis based on what you have researched.

Problem:_____
_____

Hypothesis:

IF_____
_____
_____
_____
_____
_____
_____**THEN** (will happen)_____
_____
_____
_____

BECAUSE (based on your opinion from your research on the topic…)_____
_____
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_____

Testing your Hypothesis

Now we've come to the good part. The part that all scientists can't wait to get their grubby little hands on… you guessed it… The EXPERIMENT! Designing an experiment is really cool because you get to use your imagination to come up with a **test** for your problem, and most of all, you get to prove (or disprove) your Hypothesis. Now Science Fair Rules state that you cannot perform your experiment live, so you'll have to take **plenty of pictures** as you test your experiment. **(REMINDER- DO NOT TAKE PICTURES THAT SHOW YOUR FACE)**

Step 4: Gather your Materials

What will you need to perform your experiment? **My Materials are**_____

_____

_____

_____

Step 5: Write a Procedure

A procedure is a list of steps that you did to perform an experiment. Why do you need to write it down? Well it's like giving someone a recipe to your favorite dish. If they want to try it, they can follow your steps to test if it's true. Scientists do this so that people will believe that they did the experiment and also to let other people test what they found out. **List the steps that you have to do in order to perform the experiment here:**

__1._____

__2._____

__3._____

__4._____

__5._____

__6._____

__7._____

__8._____

__9._____

_10._____

_____

_____

_____

_____

_____

_____

_____

Step 6: Identify your Variables

The variables are any factors that can change in an experiment. Remember that when you are testing your experiment you should only **test one variable at a time** in order to get accurate results. In other words, if you want to test the effect that water has on plant growth, then all the plants you test should be in the same conditions, these are called **Constant Variables:** same type of dirt, same type of plant, same type of location, same amount of sunlight, etc. The only variable **you would change** from plant to plant would be the amount of water each plant received. This is called the **Independent Variable.** The independent variable is the factor you are testing. It's also what YOU change. The **results** of the test that you do are called the **Dependent variables.** The dependent variable is what happens as a result of your test or a result of what YOU changed. Knowing what your variables are is very important because if you don't know your variables you won't be able to collect your data or read your results.

Constant Variables (things that are the SAME)_____

_____

_____

_____

_____

_____

_____

_____

_____

Independent Variables (what did you change/ what are your testing)_____

_____

_____

_____

_____

_____

Dependent Variables (what happened/ what are your results)

_____

_____

_____

_____

_____

Step 7: Do Multiple Trials and Record Data

TEST,TEST,TEST. Remember that the judges expect your results to be consistent in order to be a good experiment. This means that you need to do the experiment **more than one time** in order to test for **accuracy**. For this project, you must have three or more trials. (5th graders should have 4-5 trials!) **Don't forget to take pictures (NO FACES).**

Collect your DATA. This means write down or record the results of the experiment every time you test it. You also need to organize your data in a way that is easy to read the results. Most scientists use tables, graphs and other organizers to show their results. Organizing makes the results easy to read, and much easier to recognize patterns that might be occurring in your results.

Suppose your Problem Statement was - **Can a peanut contain enough stored chemical energy to heat a small container of water?**

This is an example of data chart with repeated trials

	The Changing Temperature of the Water			
	½ Cup of Water	1 Cup of Water	1 ½ Cups of Water	2 Cups of Water
Trial 1	**140° F**	**130° F**	**121° F**	**120° F**
Trial 2	**135° F**	**129° F**	**121° F**	**114° F**
Trial 3	**133° F**	**127° F**	**118 F**	**118° F**

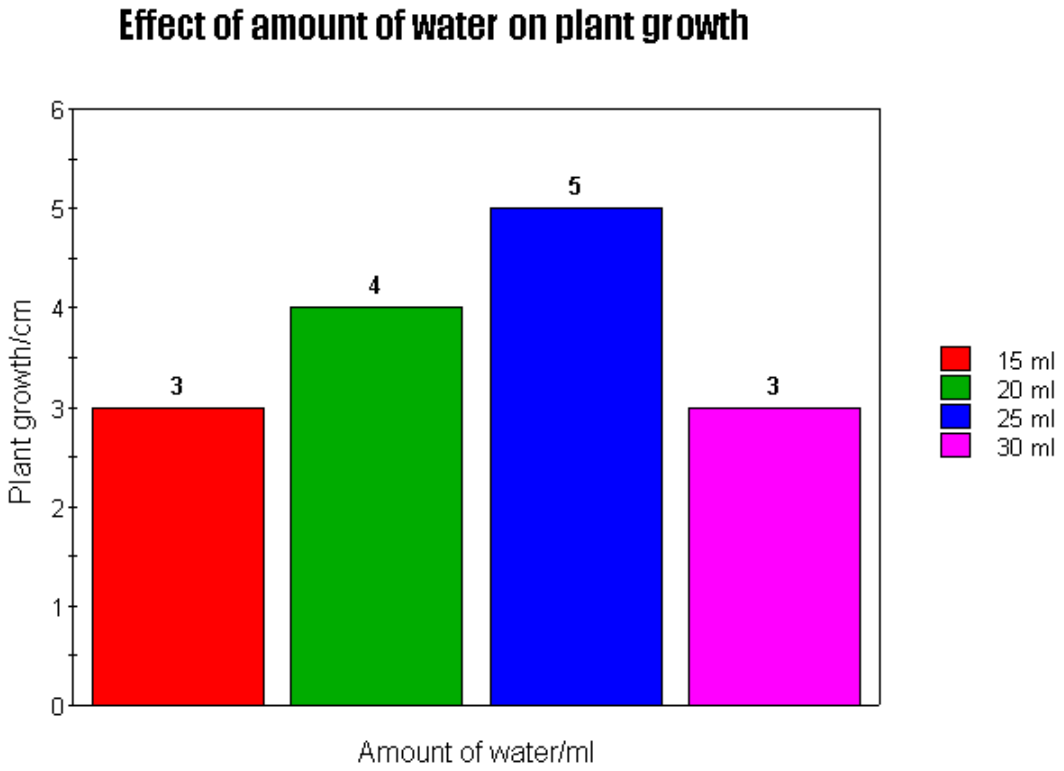
Check List to Review Your Data Charts

_____ Title for Chart

_____ Labels for Rows and Column

_____ Repeated Trials Shown

Example of Graph



Check List to Review Your Graph

_____ Title for graph

_____ Label on the X - axis

_____ Label on the Y- axis

_____ Increments correctly spaced and placed on grid

_____ Use LINE Graph (if showing a change in Time or Temperature)

Step 8: Results - What happened in the experiment?

Some students get the results confused with the conclusion. They are not the same. The result is a summary of your experiment. Analyze your data and simply state what happened.

Step 9: Conclusion - What did you learn?

Write a Conclusion to tell us what happened. Was your hypothesis right or wrong or neither? Were you successful, did it turn out okay? Would you change anything about the experiment or are you curious about something else now that you've completed your experiment. And most of all, **TELL WHAT YOU LEARNED FROM DOING THIS EXPERIMENT.**

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Now tell me what changes you would make if you had to do this experiment over again_____
_____
_____
_____
_____
__

BIBLIOGRAPHY

It is important to properly cite the sources used during your project. This includes books, articles, websites, etc. that you used for researching the project. They need to be typewritten in the following format and displayed on your project board.

There is also a free website that will format the sources for the bibliography called EasyBib.
The URL is: http://www.easybib.com/

Optional Model

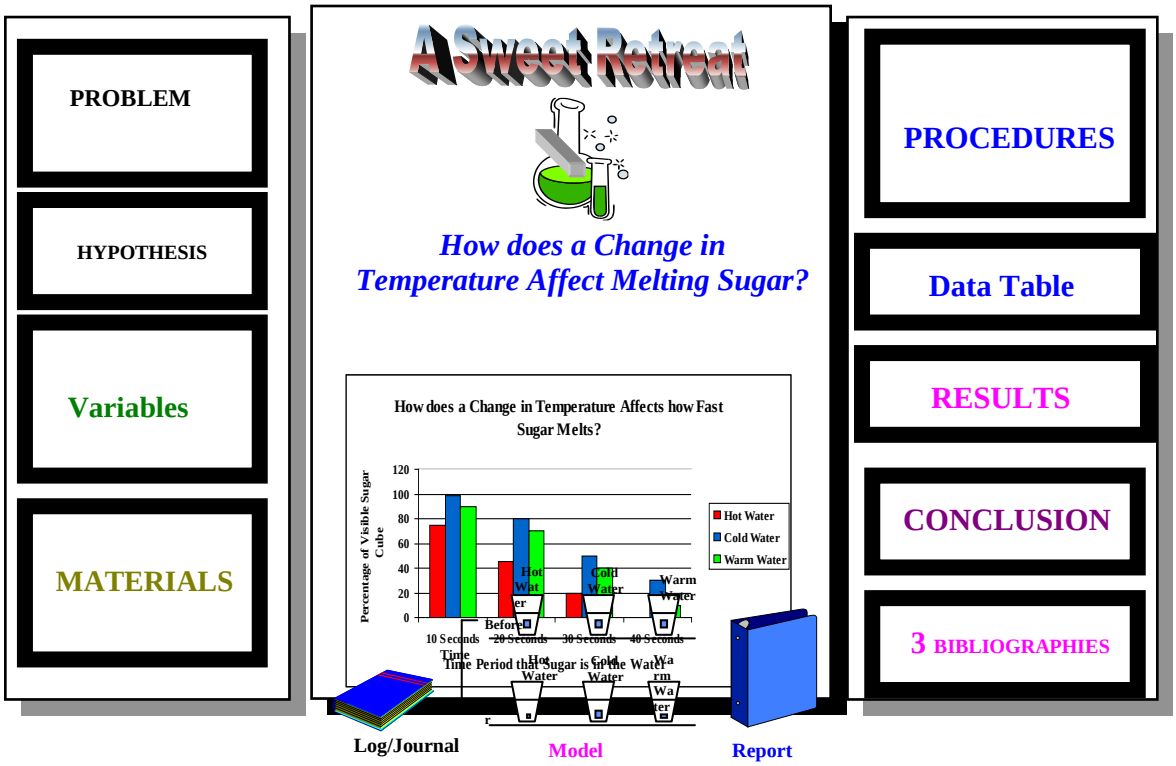
All projects do not necessarily need to have a model attached to them. If you DO choose to display a model, you CANNOT use the following in your model: water, glass, live plant, live animals, soil or things needing power outlets. Use plastic containers, construction paper, synthetic plants etc. to make your 3-D model. If you are not sure what to do, ask your teacher. **Also, projects are displayed where many people pass by for 3 days. Do not display valuable items that *may* be misplaced or damaged by accident. **

Putting the Board Together

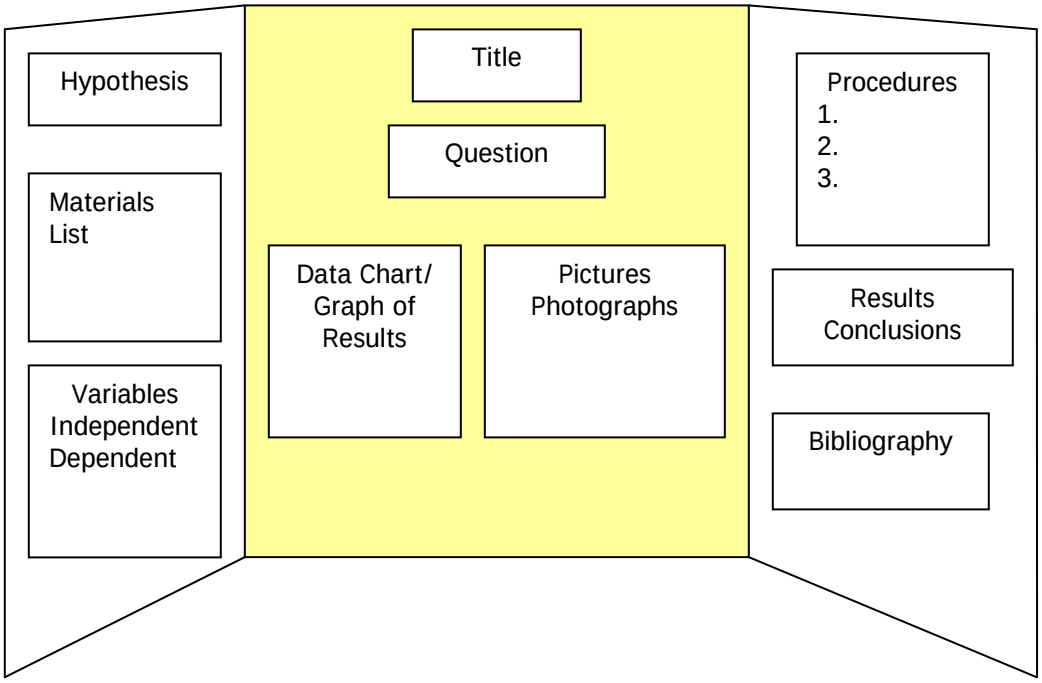
Although the main focus of science fair is completion of a scientific experiment, there are other components that are essential, as well. One of the components is a proper display of your science fair investigation. Use a tri-fold board to display your information.

1. Type all information, if possible. Place all typed/printed materials on colored backing such as construction paper. Leave a border around the edges.
2. Make your board eye-catching but keep it simple and EASY to read!
3. Display photos - Focus pictures on the items in your experiments such as organisms used or equipment, rather than people. **<u>You are not allowed to show your face in the photos!</u>**
4. Use LARGE letters for titles and headings.
5. Make sure the project has <u>no misspelled words</u>.
6. Your display board should be organized in a way that tells the "story" of your investigation.

EXAMPLE OF A DISPLAY BOARD



Tri-fold Board Display



- These are 2 ways of displaying your information. *Another way is to place the question on the left side above the hypothesis, place the procedures in the middle, and leave more room for your results and conclusion on the right side of the tri-fold.* **All** are correct, as long as you have all project parts specified displayed.

- You need to S-P-A-C-E out your project and decide which way is best for your project BEFORE you glue ANYTHING down. Use "rubber cement" glue or glue sticks. Elmer's type glue bubbles up too much.

- Each project requires a tri-fold display board.
- **HEADINGS** should have computerized lettering that is LARGE and attractive; **CORRECT SPELLING IS A NECESSITY!**
- Be creative. Use attractive colors, large print and high contrast. This is the big pictorial advertisement of your project. People should look at your board and want to see more!

- Journals for EACH student must be displayed. Models should not be larger than the space in front of the project board and should not protrude further than the front. If electric, it must be battery operated or solar powered.

Science Project Scoring Rubric
PK – 5

	Points Awarded
Content (30) o Question is clearly identified o Hypothesis is clearly stated and directly related to the question o Procedure clearly tests the hypothesis and includes safety considerations. o Experiment was replicated for reliability (at least 3 trials) o All variables were clearly identified.(independent and dependent) o Materials listed	
Results (30) o Science notebook contains dated entries, raw data and description of procedure. o Results are clearly presented and demonstrated with a table, chart or graph. o Results relate directly to the question and hypothesis.	
Conclusions (15) o Conclusion is clearly stated. o Conclusion is logical and based on data collected. o Conclusion includes questions for future research.	
Bibliography (10) o Bibliography has at least 3 references written in correct format. o Clear evidence of appropriate research for project.	
Communicating the Results (15) o Project appears well organized and shows depth of study o All parts of the experimental design process are present. o Project is neat, presented creatively and is interesting.	
Total Points (100 possible)	

PROJECT PLAN PROPOSAL AND SAFETY FORM

Grade Level: _____ Teacher's Name: _____

If a **class project**, the number of students in the class: _____

If an **individual (1)**, **group (2 or 3)** project, provide the student(s) name(s).

Student's Name: _____

Student's Name: _____

Student's Name: _____

School: Garden Oaks Elementary School___ District:_____

Title of Project: _____

(**5 words, 50 characters, maximum**)

PROBLEM/QUESTION:

_____

_____

HYPOTHESIS (If…Then…Because):

_____

_____

PROCEDURES; (Include, if applicable, safety measures, animal care measures, etc.)

_____

_____

_____

_____

_____

_____

_____

If experimentation is conducted off campus provide the name and address of adult supervisor:

Name of Adult Supervisor: _____Address: _____

I certify that I have reviewed the project plan prior to the beginning of the experiment and it does comply with the rules and regulations of HISD Science Fairs.

Classroom Teacher _____

Please Print

Classroom Teacher Signature: _____Date: _____