September 12, 2002

Dear Parents,

Attached to this paper are the guidelines and timeline for the Science Fair Project. Please sign this note and have your child return it to me immediately. This way I know you are aware of the due dates. Thank you.

Sincerely,
Suzanne M. Roden
Lani Dodd

Student's name _____

Parent's Signature_____

September 2002

Dear St. Thomas Parents,

We are planning a science fair, and we would like you to attend! With your encouragement and support, we expect all our "scientists" in grades 4-8 to participate by preparing and displaying individual projects. Students in the lower grades are invited to submit projects as well.

We feel that a science fair offers many benefits:

*Stimulates imagination and independent thinking
*Increases knowledge in many scientific areas
*Teaches the use of the processes of science
*Trains in the organization and completion of major tasks
*Provides the opportunity to enjoy science

Science Fair Date:	Nov. 18 - 22, 2002
Place:	Fitzgerald Hall
Time:	Parents may visit anytime
Project Due:	8:15 AM Nov. 18, 2002
Project Setup:	By 8:15 AM Nov. 18, 2002
Presentation:	Week of Nov. 18 - 22, 2002
Project Takedown:	By noon on Nov. 22, 2002

There are now numerous sites on the web which can aid with the development of the science project. A few of the better sites are:

* www.usc.edu/CSSF/

* www.twingroves.district96.kl2.il.us/ScienceInternet/ScienceFair.html

* www.isd77.kl2.mn.us/resources/cf/SciProjInter.html

There are also books available in Mrs. Roden's classroom for checkout at home.

Science Fair Timeline

Activity	Date Due
1. Select research question	
2. Research topic and organize resources	
3. Write hypothesis	
4. Design experiment	
5. Submit to your science teacher the "Design an Experiment" paper (two are included in packet, please turn in the last one in science fair packet).	Sept. 30, 2002
6. Conduct experiment to test hypothesis	
7. Record results and keep records	
8. Finish experiment	
9. Write rough draft of your report and submit to your science teacher	Nov. 8, 2002
10. Make display	
11. Write final report	
12. Plan presentation	
13. Set-up for Science Fair	Nov. 18, 2002

Teacher: **Student:**

Design an Experiment

Scientific area chosen (circle the proper one): Behavioral Life Physical Earth

1. Research question:

2. Hypothesis:

3. Identify independent (changed) variable:

4. Identify the dependent (measured) variable:

5. Describe the variables that you will hold constant:

6. Identify your control:

7. Describe the materials you will need to do the experiment:

8. Write the procedure to test your hypothesis (if you need more room use the back of this paper):

9. On the back of this paper, design a data table to collect and display your results:

10. What kind of graph or chart would you use to present your data (be ready to graph your data on graph paper including a title, labels, and units for the vertical and horizontal axis)? Line/bar/circle

Selecting a Science Topic

After you have selected an area of science that interests you, think about questions that you are curious about and would like to solve. The question you try to solve will be the topic of your science fair project. You need to choose a question that can be answered by an experiment that you can do. Do not choose a question that does not interest you, or one that is too hard to solve.

This sample of research questions is from four areas of science: behavioral, life, physical and earth science. These may help you think of your own research question.

How does electricity travel through wires?
How do batteries work?
What objects are attracted by magnets?
How is electricity generated from solar energy?
How can rusting be prevented?
How do integrated circuits work?
What is the shape of the magnetic field?
How does a robot work?
How can gasoline make a car move?
How can a tomato plant be grafted to a potato plant?
How does overcrowding affect life in a terrarium?
Do plants grow better in sunlight or artificial light?
How does gravity affect the growth of a plant?
How does mold grow?
How is a bridge built so it does not collapse?
How fast do different fibers burn?
How is sound obtained from a phonograph record?
What does a dam do?
How do soft drinks affect teeth?
How does a canal lock work?
How does exercise affect the heart?
Does the moon rise at the same time every night?
How do spiders spin webs?
How accurately are weather and natural disasters forecasted?
How do pesticides affect plants?
What effects do freezing and thawing have on rocks?
What are the effects of smoking? What pollutes our water?

- Write three research questions that apply to the area of science that interests you. Put a star beside the research question that you would like to solve. Do you think that you could solve it with an experiment?

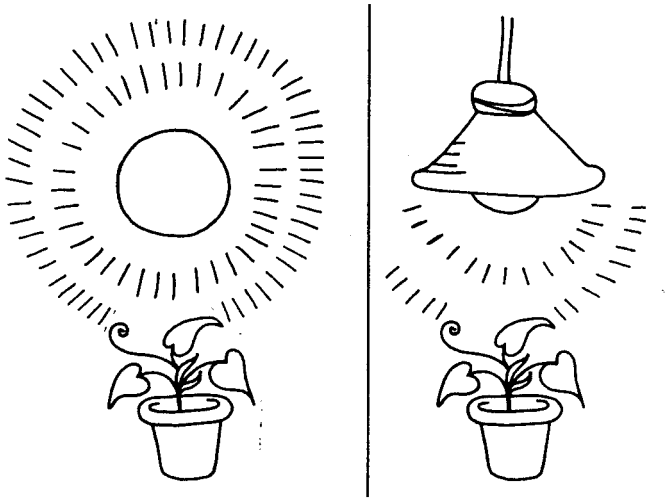
SCIENCE FAIR PROJECTS

- What evidence can we find about the rotation of the earth from star trails?
- What is the size of the earth? (Erastothenes method)
- How does the color of a background affect its absorption of solar insulation?
- How can we prevent the weathering of our sidewalks and driveways?
- How does topography affect weather conditions?
- Does the amount of water affect the size of the wave?
- How does the volume of a stream affect its flow rate?
- Where is the current of a stream the fastest?
- Does the topography of an area affect its local weather?
- How do changes in air pressure affect the weather?
- How are all weather factors related?
- Is there a relationship between phases of the moon and our weather?
- What kind of soil is best for water retention?
- How does particle size affect settling rates?
- How does sunspot activity affect radio reception?
- Will antacids help soil polluted by acid rain?
- Are our local waters acidic?
- What is in our drinking water?
- Do our soils show the affects of acid rain?
- What is the lime content of various samples of water?
- Are safe homemade cleansers as effective as commercial cleansers?
- How polluted is our water? (Use a Millipore filter to trap and study bacteria)
- What are eating disorders? (research and survey)
- Is there a relationship between eating breakfast and school performance?
- Does human hair affect the growth of plants?
- How does a garden mist spray affect plant growth?
- How does the duration of insulation affect plant growth?
- What is the percentage of water in various fruits and vegetables?
- Which plants and vegetables make the best dye?
- Which type of wildflower grows best under artificial light?
- How does temperature affect the water uptake in celery plants?
- Does the type of water affect the growth of plants?
- Growth hormones: How does Gibberellic acid affect plant growth?
- Which color of light causes green beans to grow best?
- On which foods does fungus grow best?
- How does electricity affect fruit flies?
- How do different types of liquids affect fruit-fly growth?
- How does ethylene affect ripening fruit?
- Is soil necessary for plant growth? (Hydroponics study)
- How does rotation affect plant growth?
- Does music affect plant growth?
- Does a plant grow best in sunlight or artificial light?
- Can plants deprived of sunlight recover?
- What is the relationship between root and stem growth?
- Teeth: How are they affected by flourides and acids?
- Can potatoes be grown without soil?
- How do worms affect plant growth?
- What is the effect of urine on grass?
- What effect do epsom salts have on plant growth?

Name

Writing the Hypothesis

After you have selected a research question, you have performed the first step of the scientific method. The second step is forming the **hypothesis.** The hypothesis (hi-poth-i-sis) is an educated **guess** or a possible explanation of the research question.



Kim and Carlo wanted to solve the question, "Do plants grow taller in sunlight or in artificial light?" They each wrote a possible explanation of the question, and these are the hypotheses they came up with:

Kim's hypothesis: Plants will grow the same, whether in the sun or under artificial light.

Carlo's hypothesis: Plants will grow taller in artificial light, because they will get light for a longer period of time.

- There are several other possible hypotheses. Write another possible hypothesis for Kim's and Carlo's research question.

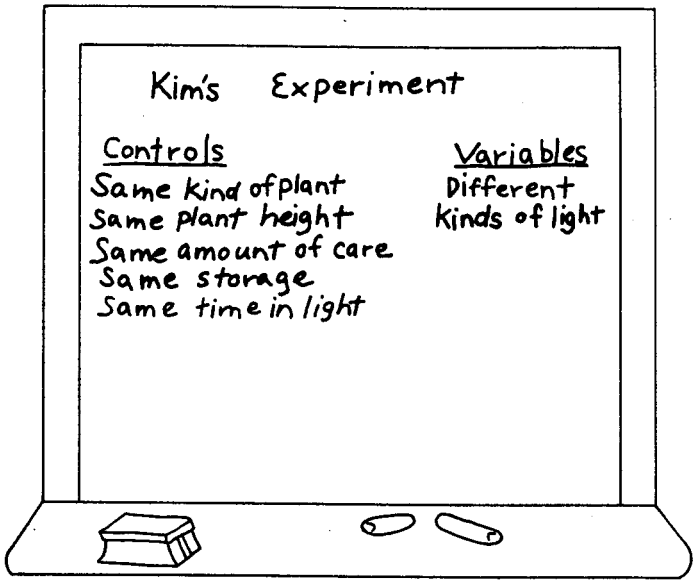
- Write your research question and 3 possible hypotheses below. Circle the hypothesis you feel is best. Why do you think this is the best hypothesis?

Name

Designing the Experiment

As you have seen, a research question can have many possible hypotheses. Though these hypotheses are different, we do not decide at this time if one is correct and the other is wrong. In fact, both hypotheses could be right or both could be wrong. We can find that out only after several experiments.

After you have written your hypothesis, the third step is to design (plan) an experiment. An experiment is a procedure that will test the hypothesis. It is important that your experiment tests your hypothesis. Since Kim's and Carlo's hypotheses are different, their experiments are different.



Kim's experiment:

1) I will buy two plants that are the same and care for them properly and equally. 2) One plant will be placed in a sunny window for five hours daily and the other plant will be placed under artificial light for five hours daily, for a period of four weeks. 3) During the rest of the day, the plants will be placed in the closet.

Carlo's experiment:

1) I will buy three plants that are the same and care for them properly and equally. 2) One plant will be placed in a sunny window for seven hours daily, another plant will be placed under artificial light for seven hours daily and the third plant will be placed under artificial light for twelve hours daily, for a period of six weeks. 3) During the rest of the day, the plants will be placed in the basement.

Both experiments involve the use of **controls--** the situations are identical except for one variable, or difference, that is being tested. Kim's experiment involves these controls: 2 identical plants that are cared for equally, receiving equal amounts of light for the same period of time. The only difference (the variable) is the kind of light they will get.

- List Carlo's controls and variables in his experiment.

- When you design your experiment allow enough time. What would happen if these experiments were done the week before the science fair?

- Write your research question and hypothesis on a sheet of paper. Design an experiment that will test your hypothesis. List controls and variables.

Name _____

Organizing Experiments

Before you begin your experiment, be organized. Organization will save you time and money. To become organized remember:

1. Before starting anything, check out all the details with your teacher.
2. Assemble all materials needed before beginning.
3. Allow plenty of time to do each step.
4. Have adult supervision. An extra pair of hands may be needed.
5. Follow all safety rules.
6. Keep records.

- Experiment I plan to do:

1. Write down all the materials you need and how you can obtain them. There are many available resources, and people who will help you. If your project involves seeds sprouting in test tubes of liquids, but you do not have test tubes, ask your teacher if there are some you can borrow. Substitutions can also be made. Glass jars will work just as well as test tubes.

Materials I need and where I can get them:

_____

_____

_____

_____

_____

_____

_____

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_____

_____

_____

_____

2. Write down the steps for completing the experiment and the time needed for each step. If you discover you do not have time to finish the project, do not start it. Choose another project.

Steps to follow and time needed:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

- Do I have the materials available and the time needed to do this experiment? _____
  If not, talk to your teacher.

Name

Results and Conclusions

As you perform your experiments you will want to carefully record your observations and measurements. After Kim wrote her research question, "Do plants grow better in sunlight or artificial light?", she formed her hypothesis: "Plants will grow the same whether in the sun or under artificial light." Then she planned her experiment and assembled the materials. She selected two identical plants that grow tall. Her next step was to carefully record each plant's growth. Kim chose to record their height on Monday, Thursday and Saturday. Once **a** week she photographed both plants to show the difference in their appearance.

Plants under sun

Monday	Thursday	Saturday
Feb. 3: 6"	Feb. 6: 6½"	Feb. 8: 6½"
Feb. 10: 7"	Feb. 13: 7½"	Feb. 15: 8"
Feb. 17: 8"	Feb. 20: 8¾"	Feb. 22: 8¾"
Feb. 24: 9"	Feb. 27: 9½"	Feb. 29: 10"

Plants under light

Monday	Thursday	Saturday
Feb. 3: 6"	Feb. 6: 6¼"	Feb. 8: 6½"
Feb. 10: 6¾"	Feb. 13: 6¾"	Feb. 15: 7¼"
Feb. 17: 7½"	Feb. 20: 7½"	Feb. 22: 7¾"
Feb. 24: 8¼"	Feb. 27: 8½"	Feb. 29: 8½"

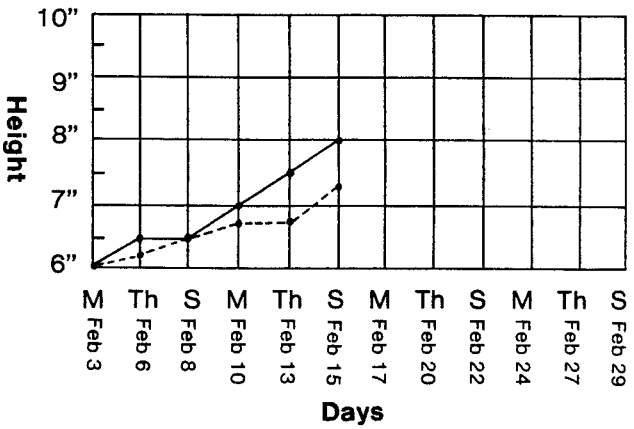
- Why was Kim's selection of plants important?

At the end of four weeks, Kim made a graph to illustrate the results.

- Finish the graph by looking at her records.

- - - - = plants under artificial light

____ = plants under sun



- Kim compared the growth of the two plants. Look at the graph. Did Kim's observations match her hypothesis? Why or why not?

- State this information as a conclusion.

- How could this conclusion help in understanding other things?

Kim's hypothesis did not match her observations. She did not get upset, because the hypothesis was a guess about something she didn't know about. Now she has learned that in her experiment the plant receiving sunlight grew taller than the plant receiving artificial light.

Name

Student Project Information Form

Scientific Area of Interest:

My Research Question:

My Hypothesis:

My Experiment:
(Procedure)

The Results From My Experiment:

My Conclusions:

How My Conclusions Can Be Applied To Understand Other Things:

People Who Helped Me with My Project and What They Did:

Name

Writing Your Report

After you have finished your experiment, you will want to combine your information into a report. If you are unsure how long your report should be, your teacher can tell you an approximate length. Your report should contain the following parts:

1) INTRODUCTION-- The name of your project, your research question, and your hypothesis.
2) INFORMATION-- Information about your topic gathered from books, various resources and people.
3) EXPERIMENT-- Description of the procedure. This part is like a recipe. It includes materials used and the directions followed.
4) RESULTS-- Information gathered from the experiment and a summary of how it turned out.
5) CONCLUSIONS-- Final remarks concerning the experiment. Was the hypothesis correct? Give recommendations and suggestions for others who may want to experiment with your topic.
6) BIBLIOGRAPHY-- List of books and references used in your report.

Writing your report is not difficult if you allow yourself enough time to do it. Jot down information as you work on your experiment. Keeping good notes will prevent forgetting important details. Proofread your report. Use correct grammar, spelling, capitalization and punctuation. Your final copy should be written neatly.

- If you have not started writing your report, begin now. Write down the due date and the estimated length of your report. Begin writing your report on another sheet of paper. Include the six parts that are described above.

Final report due date: _____

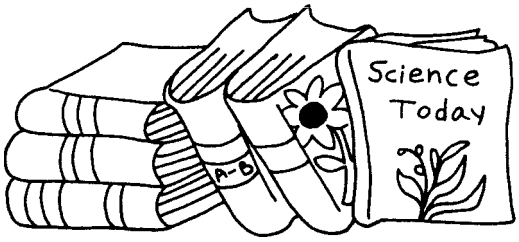
Estimated length: _____

Name

Writing a Bibliography

A bibliography is a list of books and references used in your report. It is placed at the end of a report and includes the following information:

1) Title of reference
2) Author
3) Publishing company
4) Location of the publishing company
5) Date of publication



The bibliography shows other people references they can use to learn about your topic. The easiest way to write a bibliography is to write down the information as you use the references. When you write your final bibliography you can arrange your list in alphabetical order.

How the bibliography is written depends on the references used.

A book with one author	Smith, Cindy. How Computers Work White Pine, N.Y.: Parrot Books, 1983.
A book with two authors	Long, Ted H., and Patty A. Bow. Understanding Computers. Chicago: Astro Books, 1985.
Encyclopedia article	"Computers." The Learning Encyclopedia. 1984 ed.
Magazine article	Richards, Randy. "New Ideas with Computers." Computer Life, March 1986, pp. 5-10.

- Look up 2 references you can use for your report. Write them below in proper bibliographic form, using correct punctuation marks.

? **An article in a newspaper:**

Brody, Jane E. "Multiple Cancers Termed On Increase." New York Times 10 Oct. 1976: A37.

? **An article from a CD-ROM**:

Settles, Gary S. "Absolute Zero." Grolier Multimedia Encyclopedia. CD-ROM. 1997.

? **An article from an internet site:**

Bradshaw, Gary S. "Wilbur and Orville Wright." Oct. 1996

URL: http://www.wam.umd.edu/~srwright/WrBr/Wrights.html

Try to find as much information as possible about an Internet document in order to determine whether it is accurate or not. It is especially important to try to find out about the author of an Internet document, whether a person, organization or institution.

Name

Building Your Display

Now that you have performed the scientific testing and research, you will want to display your findings for others to see and understand. Displays should be neat and informative. When placed on tables they should be:

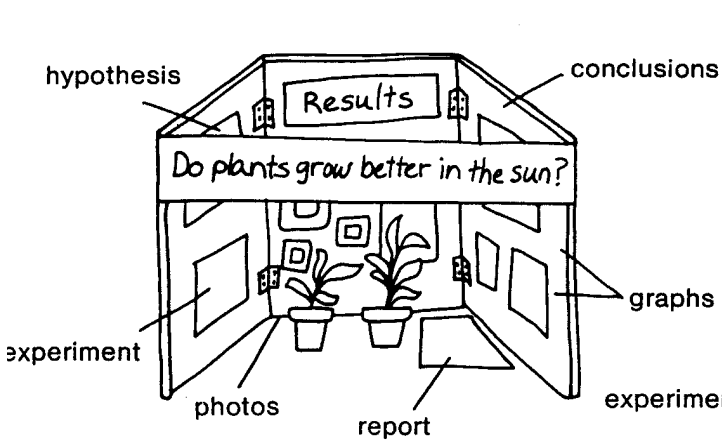
1) self-supporting and strong
2) large enough for showing charts, pictures and information
3) tall enough for viewing at eye level

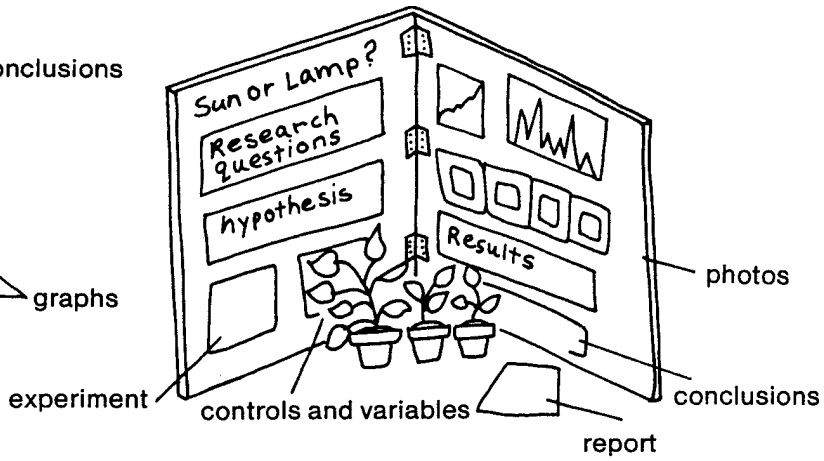
Materials often used include sturdy cardboard or plywood joined together with hinges, rings, heavy-duty tape, or twine. Large cardboard boxes can be cut to form displays. These materials can be covered with colored paper, fabric or paint.

Before you build your display, consider:

1) What materials are easily obtainable?
2) What materials are free or inexpensive?
3) What design would be the best for displaying my project?

Some common displays look like these:





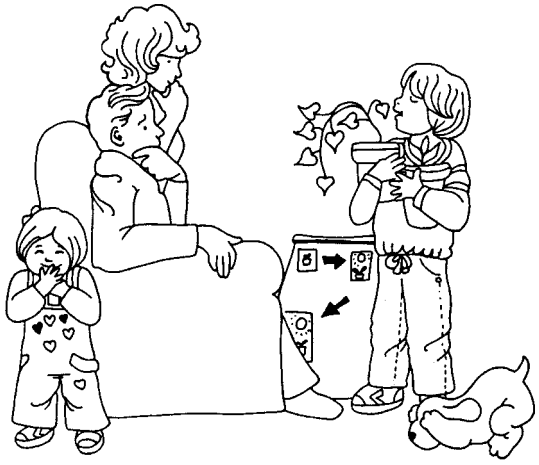
After building your display, arrange your pictures, charts and graphs in order. Include your hypothesis, procedure, results and conclusions. The title of your project should be written boldly. Choose colors that look good together.

- Design your display below
- List materials needed for your display

Name

Preparing the Presentation

Presentations are usually given when all science fair projects have been set up. Preparing your presentation is not hard. Since it requires time and practice, do not wait until the night before it is due.



Follow these steps for a good presentation:

1) Tell your research question and hypothesis.
2) Explain your experiment.
3) State the results.
4) Summarize your conclusions.
5) Describe what you learned and how this information could be applied to future learning.

The goal of a science fair is to let you solve a problem as a scientist would. Though scientists may not get the results they want, their findings can be used in future studies.

Your presentation will be better if you dress neatly and are prepared. If you do not like to talk in front of people, practice your presentation in front of a mirror, or use a tape recorder. Practice several times, until you are ready for friends or family to listen. Give them this paper so they can see that you cover all five steps.

Above all, be interested in your project. Your enthusiasm will make others interested in your project too.

- Write 2-3 sentences for each of the five steps. Practice your presentation, then give your presentation to someone.

Project Evaluation Form

Name of Project: _____

Category: _____

Number: _____

	Points				
1. **Originality and Creativity** Idea, approach and method show originality and creative thinking.	Low 1	2	3	4	High 5
2. Use of Research Techniques Scientific Method used: problem, hypothesis, experiment, results and conclusions.	1	2	3	4	5
3. Amount of Work and Organization Project indicates thought, time and care in preparation, and organization.	1	2	3	4	5
4. Validity of Information Care and accuracy in research, testing and conclusions.	1	2	3	4	5
5. Evidence of Knowledge Gained Student understands project and is well versed on the subject.	1	2	3	4	5
6. Oral/Visual Presentation Project is clearly explained by oral presentation and/or by the visuals displayed.	1	2	3	4	5

Total Points: _____

Teacher: **Student:**

Design an Experiment

Scientific area chosen (circle the proper one): Behavioral Life Physical Earth

1. Research question:

2. Hypothesis:

3. Identify independent (changed) variable:

4. Identify the dependent (measured) variable:

5. Describe the variables that you will hold constant:

6. Identify your control:

7. Describe the materials you will need to do the experiment:

8. Write the procedure to test your hypothesis (if you need more room use the back of this paper):

9. On the back of this paper, design a data table to collect and display your results:

10. What kind of graph or chart would you use to present your data (be ready to graph your data on graph paper including a title, labels, and units for the vertical and horizontal axis)? Line/bar/circle