STEM Fair Student Journal

Richland Elementary

Theme "My Future Career"

Final Project due March 10, 2020

Topic _____

Name _____

Group or Individual

_____

Teacher _____

Grade _____

I will help support my child by reviewing his/her project and by **signing** each component **prior** to every due date (5 times, see page 1)

*Parent*_____

It's STEM Science Fair Time

Our Theme is MY FUTURE CAREER

Over the next few months, you will choose your own research project that contains one or all of the STEM elements and conduct an investigation to seek the answer to your project's question.

This long-term, at home project will enable you to combine reading, writing, math, data analysis, and scientific inquiry all on a topic that **you have chosen!**

This **STUDENT JOURNAL** will help guide you through the Scientific Method and help you keep track of your work.

Steps to the Scientific Method

1. Research
2. Topic Selection
3. Question/Purpose/Problem
4. Prediction/Hypothesis
5. Experiment (Variables, Materials, Procedures)
6. Data Collection/Results
7. Conclusion

Timeline for the STEM Fair Project

Component	Due Date
Question	January 16
Prediction/Hypothesis	
Variables	January 30
Materials	
Procedures	February 6
Data Tool	
Graph and Written Explanation	February 20
Conclusion	
Research Paper	March 5
Display Board to School	Tuesday, March 10, 2020

Getting Started

There are many ways to choose a STEM Fair topic. You can start by:

- Observing the world around you
- Searching the internet
- * Looking at books in your school library
- * Looking at books in our public library

You can also use the list below to determine a category of STEM topics that interests you.

Earth/ Environment	Chemistry	Physics	Life/Biology	Engineering	Mathematics
Weather Rain Climate Erosion Wind speeds Water filtration Recycling processes composting	Freezing Melting Burning Rusting Heat	Speed Force friction Gravity Magnets Electricity Elasticity Weight/mass Density	Plant growth (based on: water, temperature, sunlight, soil type) invertebrates	Bridge design Building design Machine design	Probability Number relationships Frequency analyses

As you develop your project idea, consider the following questions with your family:

- Do we have time for this project or should we choose something that is shorter?
- Do we have the space (inside or outside) for this project?
- Can we purchase all of the items for this project or are some too expensive or too hard to find?
- Will we need to build anything and, if do, can we do it?

Still need help with your topic????

Topic Selection Wizard Tool https://www.sciencebuddies.org/

Date_____

The Question is also referred to as the PROBLEM or the PURPOSE. A good question is the key to a good science fair project. Scientists ask questions and then conduct experiments to find out the answer. Therefore, the question asked should only be answered by performing an experiment, not by looking in a book.

Be specific when writing a question. For example:
Instead of asking – How do bean plants grow?
Ask: 1. Does the amount of water affect how tall bean plants will grow?
2. Does soaking bean seeds before planting affect how fast they will germinate?
3. Do bean plants grow better in an acid soil or an alkaline soil?

Use the space below to write a rough draft of your question.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

☐ Question is not approved. Make revisions on a separate sheet of paper and attach it to the book.

☐ Question is approved. You are ready to write your hypothesis/prediction.

Teacher Signature _____ Date _____

Parent Signature _____ Date_____

Revising your Question: Try to state your question more clearly. Be sure the question you decide upon can be answered by collecting data in an experiment.

☐ Question is not approved. Make revisions on a separate sheet of paper and attach it to the book.

☐ Question is approved. You are ready to write your hypothesis/prediction.

Teacher Signature _____ Date _____

Parent Signature _____ Date _____

Write approved question in pen here:

The **HYPOTHESIS** is another name for a **PREDICTION**. When you are writing the hypothesis you are trying to predict the answer to your question. You should always give a reason for your prediction either from your own experiences or from research you have done.

For example:

Question: Does soaking bean seeds before planting affect how fast they will grow?

Possible Predictions:

I think that bean plants that have their seeds soaked before planting will grow faster **because** it will make the hard seed covering soft.

I do not think that soaking the beans will make the bean plant grow faster **because** soaking the seed will just make the seed mushy.

Rewrite the approved question in pen:

Hypothesis/Prediction:

Approved on _____

Teacher _____

Parent Signature _____

VARIABLES

Take time to identify your variables before you start your experiment. It will help you to write your procedures. A variable is something that can change or be changed. There are three kinds of variables: independent, dependent and controlled variables.
In a well-designed investigation, there should be only one thing changed on purpose, called the independent or manipulated variable.

Remember the example question: Does soaking bean seeds before planting affect how fast they will grow?

In this example, the thing I am changing on purpose is the soaking the some of the bean seeds before planting them. Therefore, the soaking of the seeds before planting is the independent variable (manipulated variable).

What I think or hope will change during the experiment is called the dependent variable or responding variable.

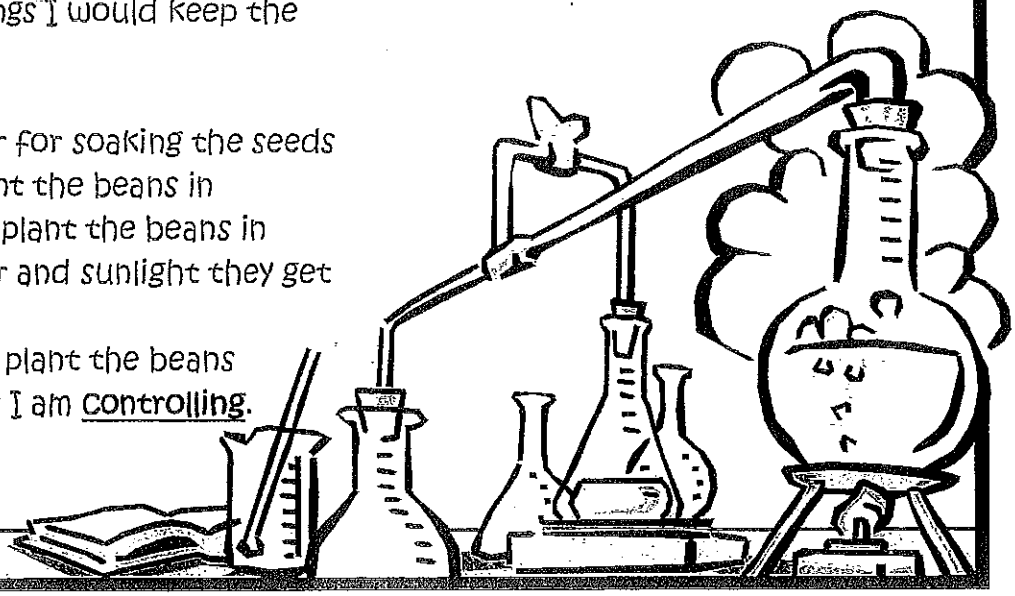
In this example the thing I am hoping or thinking will change during the experiment is how fast the plant grows. Therefore, how fast the plant grows is the dependent variable (responding variable).

I must try to keep any other things that might be changed the same throughout the experiment. These things that I keep the same are called the controlled variables.

In this example the things I would keep the same are:

- Type of bean
- Amount of water for soaking the seeds
- Type of soil I plant the beans in
- Amount of soil I plant the beans in
- Amount of water and sunlight they get everyday
- Size containers I plant the beans

These are the variables I am controlling.



Identifying Variables

Date _____

Independent Variable - what I have changed on purpose:

Dependent Variable – What I think/hope will change during my investigation:

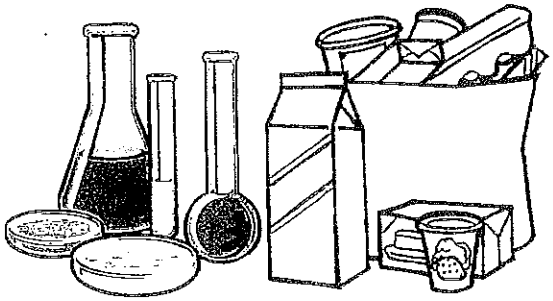
Controlled Variables – what I have kept the same:

Approved on _____

Teacher _____

Parent Signature _____

Date _____



Your MATERIALS is a list of all of the items you will need in order to conduct your experiment. As you develop your procedure, you may need to add to your materials list.

Remember to:

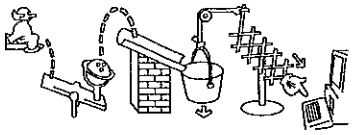
- Be specific
- Give amounts and sizes
- Use METRIC measurements

Materials:

Approved on _____

Teacher _____

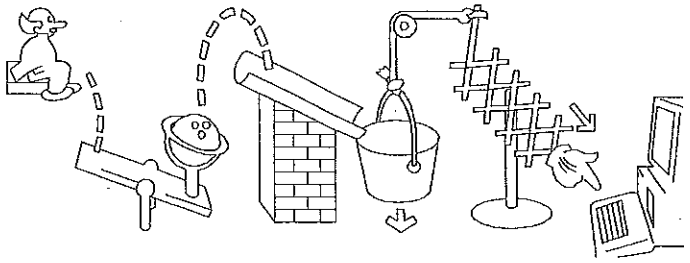
Parent Signature _____



Date_____

PROCEDURES are a detailed step-by-step set of directions of how to conduct the experiment. Details are very important here. Be sure to tell exact amounts of things such as materials, time it will take, etc. It is important that anyone be able to follow your steps and repeat your experiment exactly as you did it. You MUST have **at least 3 repeated trials** and clearly identify what you are keeping the same and what you are changing (**variables**) to ensure a **well-designed investigation**.

Procedures:



Date _____

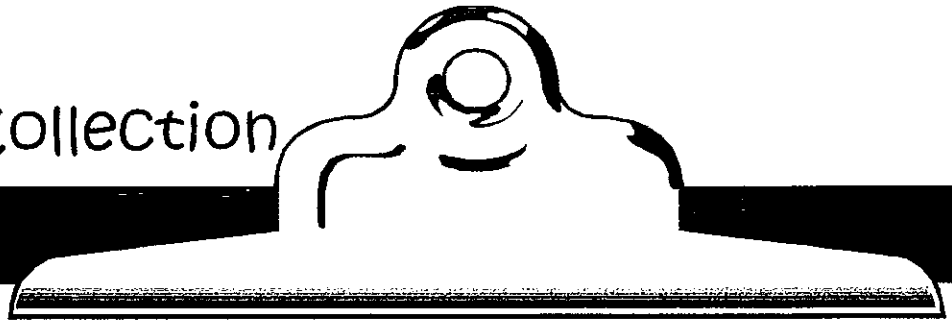
Procedures - continued

Checked on _____

Teacher _____

Parent Signature _____

Data Collection



Before you start conducting your experiment, it is important that you have thought out your data collection.

- To begin, you should design a chart, table, or journal entry system to record your information. Whenever possible, you must collect NUMERICAL DATA in a chart or table because you are expected to provide both a graph and written results for your project. Your teacher will help you if your experiment requires data that is not in numbers.

- Your chart or table should have room for repeated trials (no less than three - the more trials you complete, the more reliable your data and conclusion) and a place to find the average (mean) of your data.

- The data should be collected using metric units whenever possible because metric is the international system of measurement for scientists. Metric units include centimeters, meters (linear), grams (weight/mass), and liters (liquid volume). Again, consult your teacher if you are not sure which measurement to use.

- Use a ruler to draw straight lines when designing your chart or table. Neatness will help you to keep accurate data.

- Label the different rows and columns of your chart or table. Also include a title.

Remember you will need accurate data to create a graph, report your results, and draw a conclusion.

Checked on _____

Teacher _____

Parent Signature _____

Use this space to design a chart or table to collect your data.

Use this page for journal entries made while conducting the experiment. Notes may be brief but should be very descriptive. Always include the date for each entry.

Checked on _____

Teacher _____

Parent Signature _____

These pages are for students who are not able to collect numerical data due to the nature of their project or for students who wish to include descriptive data along with their charts or tables.

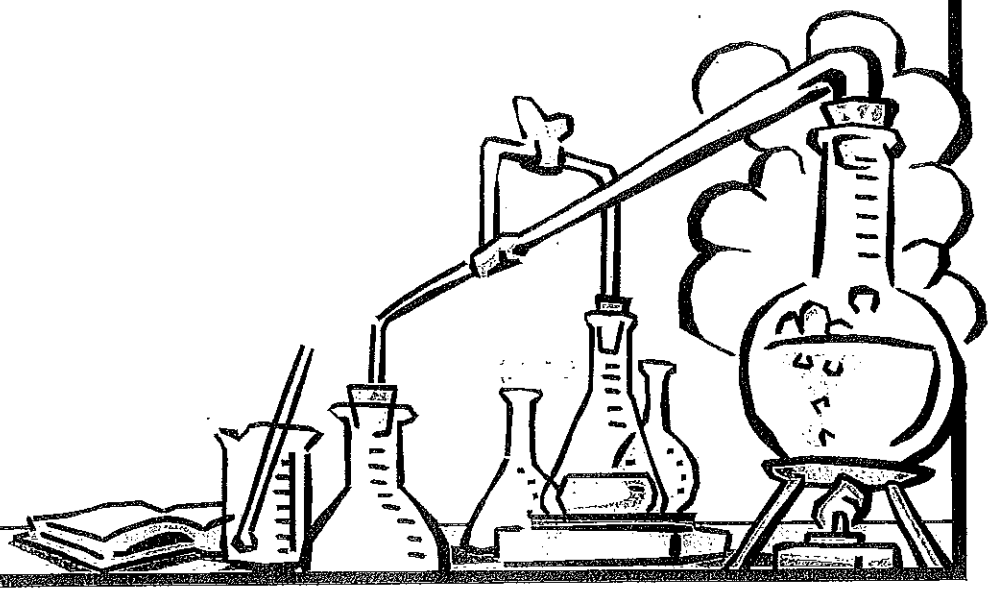
You are now ready to conduct your

Experiment

To conduct the experiment you will need to:

- follow the procedures just as you wrote them;
- keep accurate records by filling in your data chart and making journal entries as you go;
- have all the materials gathered together before you begin.

I will need _____ to conduct my experiment. (Time Frame)



All RESULTS should include three parts: a data chart; an appropriate graph (line, pie or bar) of the data collected in the chart; and a written explanation of the chart information and the graph.

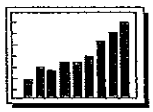
Graphs

When choosing a graph, be sure to use the most appropriate one.

Line graphs should be used to display continuous data. Experiments that have dependent variables that involve temperature, time, mass, height or distance will *usually* result in data that can be graphed on a line graph. On a line graph, the horizontal (x) axis is always the independent variable and the vertical (y) axis is always the dependent variable. Line graphs should also have:

- numbers (scale) in even intervals (1's, 2's, 5's, 10's, 100's, etc.),
- labels for the horizontal and vertical axes,
- and a title that reflects the information that is being graphed.

Bar Graphs are used to display data that separate or are distinct from other pieces of data. The data in a bar graph can be displayed either vertically or horizontally. A bar graph should include:

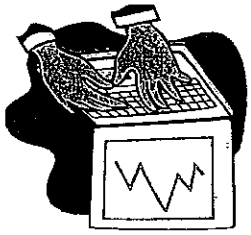


- numbers (scale) in even intervals (1's, 2's, 5's, 10's, 100's, etc.),
- labels for the horizontal and vertical axes,
- and a title that reflects the information that is being graphed.

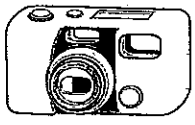
Remember to find the AVERAGE or MEAN of your DATA before graphing.

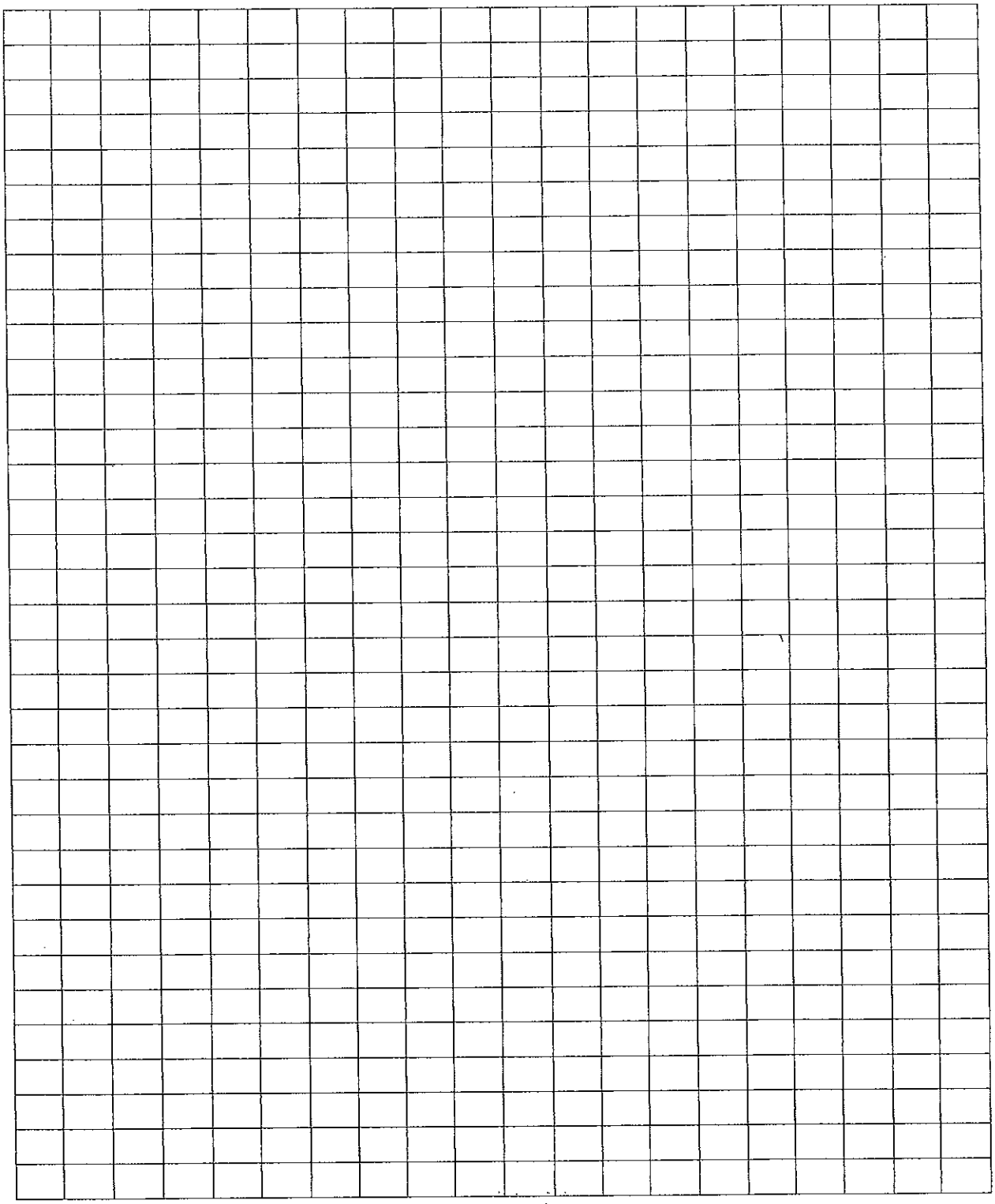
Pie Graphs should be used only when the results are best shown as a percentage of a whole. The data of a pie graph should include:

- a circle that is divided into the necessary number of parts,
- sections (or slices) of the pie should be sized accurately according to the data,
- labeled sections or color coded with a key,
- and a title that reflects the information being graphed.



Be extra careful when using a computer to create your graphs. The computer will create any graph you want, whether it is the correct graph or not. Also, many computer graphs leave off important titles and labels.





Date _____

A WRITTEN EXPLANATION gives a brief explanation of the data on the chart and graph. It can include any trends that may occur in the data. This is not the conclusion. It is simply a **summary** of what the data shows.

Checked on _____

Teacher _____

Parent Signature _____

Date_____

The CONCLUSION tells what you learned about the topic by completing the experiment. It contains many parts. Answer each of the questions below. Then join them together in paragraph form to write your conclusion.

Was my hypothesis/prediction correct or incorrect? _____

What is the answer to my question? Support the answer with data collected.

Were there any problems with the investigation or things I would do differently?

Date_____

What other things would I like to investigate about my topic? _____

How does what I learned apply to the real world? _____

Checked on _____

Teacher_____

Parent Signature _____

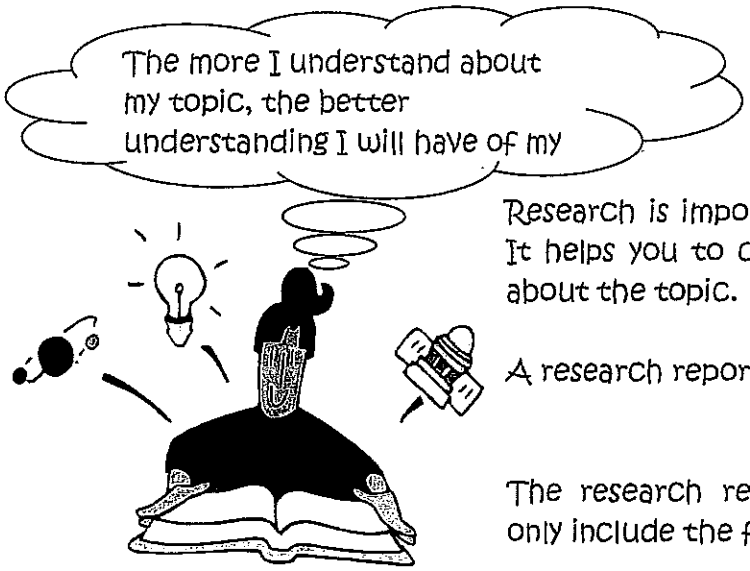
Now, rewrite your answers to the previous questions together to form a complete conclusion.

Date_____

Checked on _____

Teacher_____

Parent Signature _____



RESEARCH

Research is important to a good STEM fair project. It helps you to choose a topic and then learn more about the topic.

A research report is <u>mandatory</u>. It must be typed.

The research report is not complicated and need only include the following five things:

1. <u>Title Page</u>- The title page includes the title of your project, your name, school, grade, teacher and the date the project is being turned in to your teacher.

2. <u>Acknowledgements</u>-This is a personal thank you to anyone who helped you with the project (teacher, parent, sibling, scientist, librarian etc.).

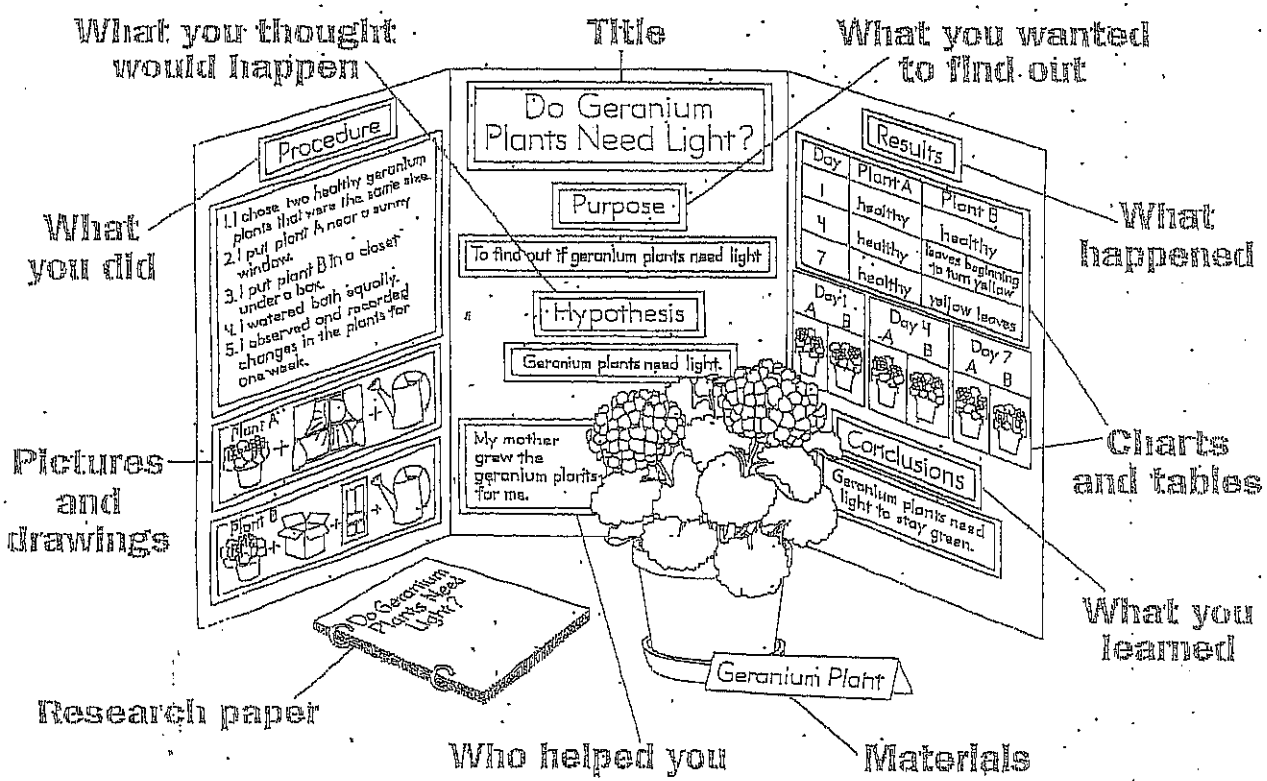
3. <u>Question</u>- The specific question you asked for your experiment

4. <u>Background Research</u>
   a. If you made a list of things you wanted to know about your topic on your brainstorming pages (pp. 4-6), this is a good place to start your research. Write down some questions that could be found through research about your topic, if you haven't done this already.
   b. Use books from the library and internet sites to find out interesting and relevant information about your topic.
   c. Rewrite the information you find in your own words. Do not copy from the book or print out pages from the Internet. This is considered PLAGARISM and it is illegal. If you are having difficulty putting what you read in your own words, try saying aloud a small section that you have just read without looking at the text. Chances are, you will put say this section in your own words. If you need help, ask an adult for assistance.
   d. Use quotes or parenthesis when appropriate in your writing.

   Keep track of what books or websites you used to get your information so you can list your sources in a bibliography.

5. <u>Sources/Bibliography</u>- An alphabetical listing of books, articles or other sources including websites that you used when researching your topic. Look in the appendix for specific rules for writing a bibliography. You should have information from at least THREE sources. Wikipedia does not count.

Displaying a Science Fair Project



PROJECT RUBRIC

Name: Class:

PROJECT ITEMS	DESCRIPTION	POINTS	TEACHER NOTES
QUESTION	Question should be clear and specific, and ask what you are trying to find out through your experiment.	10	
HYPOTHESIS	Hypothesis should be written as an an "If / Then" statement, and must be able to be tested.	10	
MATERIALS	Include complete list of items needed to complete your project. *(Page 8)*	10	
PROCEDURE	Procedure should include specific step by step directions. *(Pages 9-10)*	12	
DATA & RESULTS	Experiment is summarized. All data should be related to the hypothesis. Should include pictures and/or graphs.	15	
CONCLUSION	The conclusion should restate the question and hypothesis. Was your hypothesis correct? Did the experiment answer your question? Do you have more questions now that the experiment is complete? Were there any errors in your experiment? What did you learn and how does it apply to the real world?	15	
RESEARCH	Research on your topic is complete and includes ____ sources.	10	
DISPLAY BOARD	Display board is neat, organized and easy to read. Few spelling grammar or punctuation errors. Displays each of the above parts of the project.	18	