Brazosport Independent School District
Office of Science Curriculum
Sheree Speir, K- 12 Science Facilitator

Science Projects

Helpful Hints

Science Projects

A science project is an investigation using the 'scientific method' to discover the answer to a problem or question. The 'scientific method' is a tool to help organize thoughts and possible solutions. It is a process or a plan to follow that allows the best solution to be found. Experimental science projects should include all steps of the scientific method. Students should write the information about each step of the project in a science journal or log book. Science projects do not always turn out as planned, but this also is an answer. Below are the steps of the scientific method:

Define the Problem
Research the Topic
Form the Hypothesis
Test the Hypothesis with an Experiment
Record Results
Make a Conclusion

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A Science Project is NOT a

Demonstration of a process
Model of something
Research Paper

Steps of Scientific Method

Step 1. Define the Problem

First, the student needs to select a topic. To help in finding a topic, the student can:

a. Read science book, magazines, newspapers, websites
b. talk to your family, teacher, librarian
c. talk to scientist in the medical field, industry, or agriculture

Second, the student needs to decide on a question to solve about the topic. It should be:

a. interesting to the student
b. one they could not already answer
c. one they can solve by an experiment
d. one they can measure results on
e. limited to one problem
f. age appropriate
g. creative & original

- **Beware of science fair projects on the internet that are really demonstrations.**

A GOOD Problem is ...

1. Does the type of bread, wheat or white, affect how fast it will mold?
2. Do plants grow taller in a taller pot?
3. Is a person's heart rate changed by the type of music being listened to?
4. Does drinking a coke affect the accuracy of playing a video game?
5. Which brand of detergent gets a grass stain out the best?

A GOOD Problem is NOT...

a. What is a wave?
(*look it up in the dictionary*)
b. Which star is closest?
(*can not design a test*)
c. What exercise makes me the hungriest?
(*not measurable*)
d. Does a plant grow better in sandy soil with a blue light at 90°?
(*too many problems to check - soil, light, temperature*)
e. How do volcanoes erupt?
(this is a demonstration, not an experiment)

Step 2 – Research your topic

The student needs to collect information about their topic and question. Find out what is already known about the topic. This background information will help the student become familiar with related vocabulary and help them understand how to set up their test or experiment on the topic.

The student can collect background information from:

a. personal experiences
b. interviewing experts
c. science textbooks & other nonfiction books
d. science websites
e. consumer magazines & reports
f. television news reports

Research Guidelines

- include at least three sources of information
- magazines, reports and books published within the last 5 years
- always list the sources at the end of the back-ground information or in a bibliography

Step 3 – Hypothesis

The student needs to make a prediction or guess about the answer to the problem or science question. The prediction or guess is called the **hypothesis**. The student's prediction is based on the information they gained in the background information.

Guidelines for the hypothesis

- Hypothesis must be written in the science journal before the experiment begins.
- Hypothesis is written as a prediction.
- Hypothesis can be tested & measured.
- Hypothesis is not changed if the results of the project are different

A good hypothesis is...

Problem: Does the type of bread, wheat or white, affect how fast it will mold?

Hypothesis: The wheat bread will grow mold sooner than the white bread.

A good hypothesis is NOT...

Problem: Does the type of bread, wheat or white, affect how fast it will mold?

Hypothesis: The mold will grow on the bread that remains the moistest.

Step 4 – Experiment

The student will **design a test or experiment** that will help them find the answer to their science question.

There are many things that could have an effect on the results of the experiment. These things are called **variables**. There are three types of variables.

The **manipulated variable** is what is being tested and the one thing that is changed**.**

All other things in the experiment that will be kept the same and will not affect the results are called the **control** or **controlled variables**.

The **responding variable** is what is observed as a result of the experiment. It is the measurable results.

As the student designs their experiment, they need to plan for each of the three types of variables.

Example:

Problem: Does the type of bread, wheat or white, affect how fast it will mold?
Manipulated variable: type of bread-wheat or white
Control variables: same freshness of bread, room temperature the same, room humidity the same, place in same type of container, same amount of light, done during same period of time
Responding variable: the growth of mold

The **experiment** will include:

a. materials
b. safety
c. procedures

Material

The students will list all the materials used in the experiment. Include how much and what type of materials. The amounts should be written in metric units.

Example
Problem: Do plants grow taller in a taller pot?

A good Material list is...

3 plants- 6 cm height
1 clay pot – 1 liter
1 clay pot - 5 liter
1 clay pot – 10 liter
1 100 kg bag potting soil
1 watering can
1 grow light
1 10 kg. bag of pebbles
1 gardening spade

A good Material list is NOT...

Plants with various containers
Soil & water

Safety

All projects must include a statement about the safety concerns of the project.

Guidelines

- Parent/adult supervision –required of all projects
- Safety goggles –required of all projects that include any source of heat and household chemicals or other chemicals
- Wear gloves – **latex gloves** required of all projects that involves bacteria/mold and **insulated gloves** required of all projects with hot objects
- Veterinarian approval – all projects involving vertebrate animals require documentation that a vet has reviewed and approved project
- Sterile Technique – required of all projects involving bacteria or mold (see appendix)
- Science Specialist Supervision – required of projects requiring a depth of science background beyond their classroom teacher's resources

Procedures

The student will list step by step directions to the experiment. Anyone should be able to duplicate the experiment by following the procedures and get the same results.

Example:

Problem: Do all brands of paper towels absorb the same amount of water?

A good Procedure is...

Procedure:

1. Cut three 15 x 15 cm squares from each brand of paper towels.
2. Label the brand name with each square
3. Pour 50 ml of room temperature water into a 20 cm x 20 cm square cake pan
4. Place one square of paper towel into the water in the pan.
5. let the square soak for 30 seconds
6. Remove the paper towel square.
7. measure the water remaining in the pan and record the amount
8. Dry the cake pan
9. Repeat steps 4 – 8 for each brand of paper towel.
10. Repeat the entire process twice for each brand of paper towel.

A good Procedure is NOT...

1. Place a square of three brands of paper towels on the table.
2. Take a cup of water and pour some water in the center of the square.
3. Measure the distance the water spreads out from the original spot poured.

Step 5 – Results

Recording Results

The student will record the observations and results from the experiment. The record keeping entry should be dated and can include:

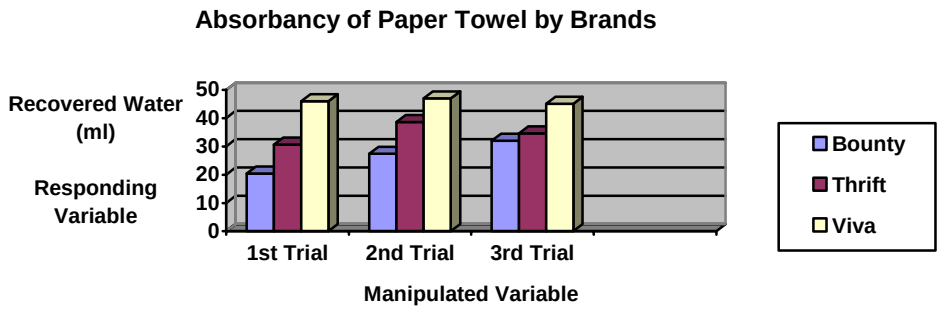
a. written observations
b. measurements recorded in charts
c. photographs

Graphing Results

After the measurable results are recorded in the charts, decide how the information will be displayed.

Example:

	1st Trial	2nd Trial	3rd Trial
Bounty	20.4 ml	27.4 ml	32.0 ml
Thrift	30.6 ml	38.6 ml	34.6 ml
Viva	45.9 ml	46.9 ml	45.0 ml

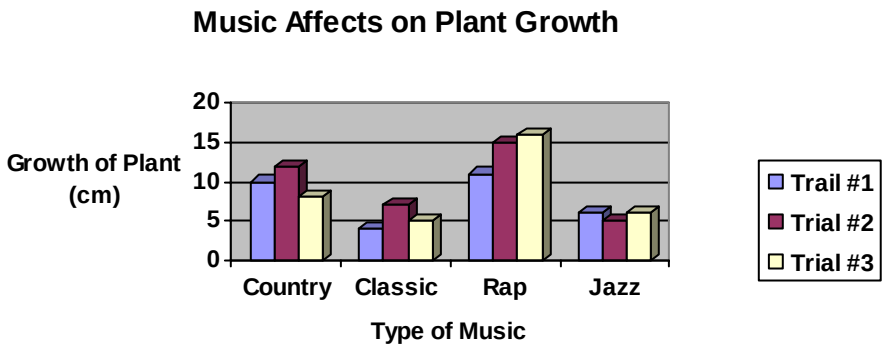


The graph should have a **title** which is a short description of the information. The horizontal axis should have the **Manipulated Variable** displayed on it. The vertical axis should have the **Responding Variable** displayed on it. There should be a **label**

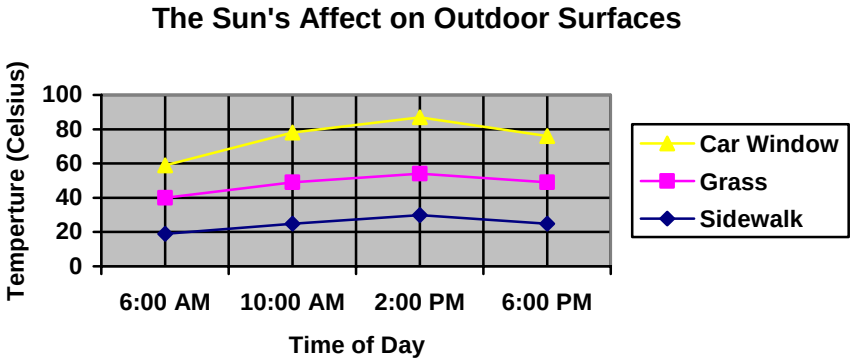
on both axis and units of measure are included. A brief sentence should explain the graph.

There are two main types of graphs: Bar Graphs and Line Graphs

Bar Graphs are used to display the same kind of data for different things.



Line Graphs are used to display data that changes as time passed. It is continuous information and the shape of the line tells whether something increases, decreased or stayed the same.



Step 5: Conclusion

The conclusion is a **summary** of the information collected in the experiment. What do the results prove? Does it agree or disagree with the project's hypothesis? The project should state if the data **agrees or disagrees with the hypothesis**. If the results are not clear, then state not enough data to agree or disagree with the original hypothesis & more testing is needed. In this section the student can include problems. The **problems** are things that occurred during experimentation that could cause the outcome to be different. For example, one of the three plants died or the cat knocked half the soil out.

The project's conclusion ends with ideas of how the student could revise the experiment to improve on the results or extend on other areas of the project that could be studied. This is referred to as '**Further Study**'. The student does not have to actually do the revisions but think of ways of improving or expanding the design.

Presentation: If the student plans on entering their science project in a science fair, all five parts of the project need to be displayed on a board. See Appendix for an example. The science journal is also required to be displayed.

Appendix

Sterile Technique
to be used with **Bacteria** & Mold Cultures

1. Wash hand, wear goggles & gloves (you may borrow goggles from BISD if necessary)

2. Turn off AC/ vent system, close door, this circulates dust in air, mold spores are sometimes attached to dust particles.

3. Wipe working surface down with alcohol or 10% ammonia/water

4. Sterilize (dip in alcohol) any utensils that may touch the object you're testing

5. If you are testing if a certain food object will mold, it must be in a container: Petri dish or ziplock bag. Once the object is placed in the container, it should be sealed (tape Petri dish/ snap ziplock shut). You should not open the container through out the experiment. When viewing the object, do not hold it close to your face or smell it. Observation must be made in the container.

7. When experiment is over, throw the container away without opening it.

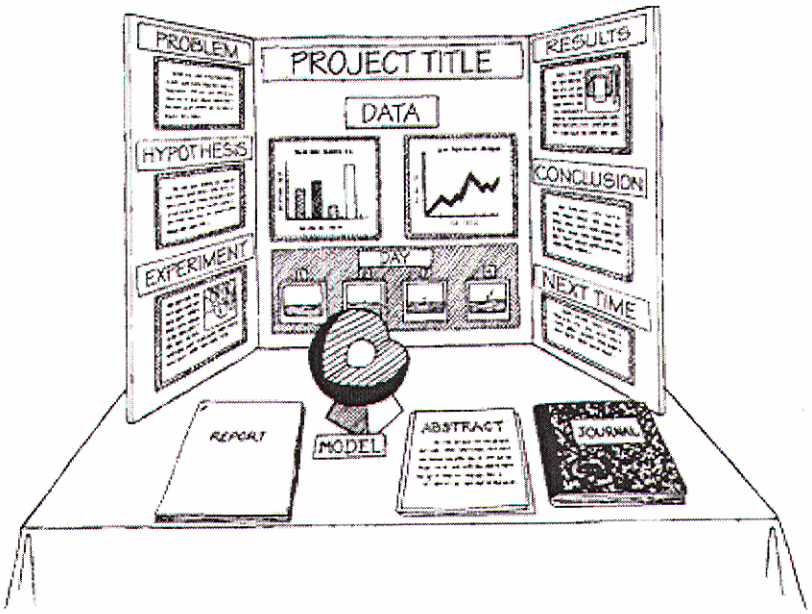
8. Wash hands; wipe down work area with 10% ammonia/water mixture or alcohol

2008 Brazoria County Science Fair
Experimental Project Judging Form
Pre-K through 6th Grade

Criteria	Point Value		
Project Objective:	Very Strong	Missing	Weak
Clear statement of problem or question	**6**	**5**	**3**
Creative and original	**4**	**3**	**2**
Background Knowledge			
Research of key scientific concepts	**5**	**4**	**3**
Use of relevant resources in background	**5**	**4**	**3**
Experimental Design			
Hypothesis: stated as a prediction & testable	**6**	**5**	**3**
Variables: Identification and description of all relevant	**6**	**5**	**3**
Control or controls: are present and used as a standard for comparison	**6**	**5**	**3**
Repeated trials: experiment was repeated or large number of experimental subjects were tested	**5**	**4**	**3**
Materials and Equipment: suitable for experiment and described clearly	**5**	**4**	**3**
Procedure: Clear and detailed	**5**	**4**	**3**
Laboratory Notebook: accurate, dated record of project	**8**	**6**	**3**
Safety: procedures for safety are discussed and followed	**5**	**4**	**3**
Results:			
Graphs and Tables: correct type used, labeled, clear, quantitative measurements, label units	**5**	**4**	**3**
Summary: explains the data on the graphs/tables	**5**	**4**	**3**
Conclusion:			
Discussion of major findings	**5**	**4**	**3**
Statement of how data supports hypothesis	**6**	**5**	**3**
Suggestions for further study	**4**	**3**	**2**
Display:			
Attractive, clear and creative	**4**	**3**	**2**
Displays all steps of project and follows Fair rules	**5**	**4**	**3**
Sub-total of All Points			
Participation Points	**+10**		
Project Grade Total Points			

Science Fair Display

A science project competing in a science fair must be displayed on a free standing board, for example, a tri-fold cardboard or a foam board. The exhibit size is limited to 76 cm front to back, 122 cm side to side and 274 cm from floor to the top of the display. Projects will be placed on a 76 cm high table. All parts of the project should be displayed on the board. A lab journal or log book containing the project's notes is required to be displayed also. The student's name on the outside of the book must be covered. No pictures of student's faces or names are allowed on the boards. Models, specimens or equipment used in the experiment and which help explain the project may be displayed. For safety of the public, no chemicals, sharp objects, glass containers, or expensive equipment will be allowed to be displayed with the projects.



Information on the Brazoria County Science Fair can be found on the following website: http://www.brazosportisd.net/scfair/default.htm

Acknowledgments

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