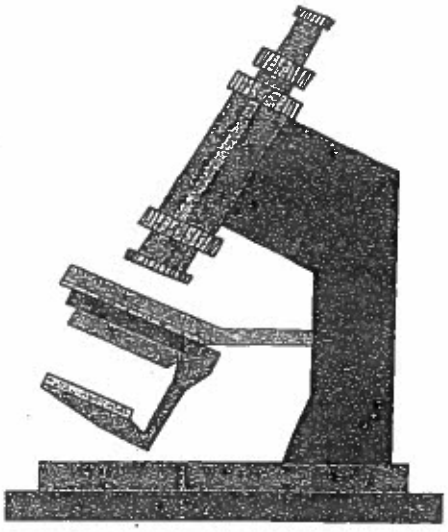
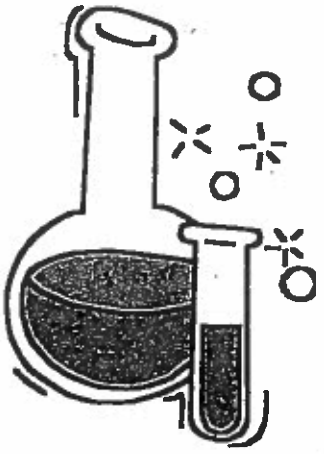


Belleview Elementary Science Fair

January 25, 2018



Introduction

It's Science Fair time and you are expected to be a researcher, scientist, author, editor, and artist. Even though most of you are not expert in all of these fields, you are expected to produce a well thought out and presented project.

For many of you, one of the most time consuming parts of the project is selecting a topic of research. It is a challenge to decide on a topic that is original and interesting. An experiment can be based on many topics. Topics do not have to be "science stuff"! You do not have to have test tubes, microscopes, batteries, etc. Begin with your own interests. Do you like cooking? Alter a recipe and measure the results. Have you ever wondered if a brand of product you use works better than its competitors? What DO you wonder about? Experiments can be conducted in many non-science, as well as science, areas. Keep in mind that you will be more invested in doing a thorough investigation if the topic is something that interests you!

A more common way of selecting a topic or experiment, is to reference the lists of potential projects included in this packet or, visit the media center which has several books in the science section which provide thoughtful ideas for a science fair project. You can even go online at www.sciencehunt.com.

Remember, you have to support the hypothesis based on changing a variable. Some project suggestions that you find in books, are actually *demonstrations* because there is no variable that has a change which effects an outcome. Your hypothesis should not be able to be answered with a simple yes or no. Rather, it will be a guess whose answer is either supported or not supported by experimenting.

Statement of the Problem

The statement of the problem is usually just one sentence. It is very important that it is written correctly. The independent and dependent variables are written in the statement of the problem.

The independent variable is the variable that is changed and tested. The dependent variable is the measure of the change. The problem ends with a question mark.

Sample:

How will the number of paper clips, 0, 1, 3, or 5, attached to the nose of a paper airplane affect the distance that it will fly?

Hypothesis

The hypothesis is an educated guess concerning the outcome of the experiment. It contains the independent variable (thing changed and tested), and the dependent variable (measure of the change).

The hypothesis ends in a period. The hypothesis will be written again in the conclusion.

Sample Hypothesis

If 0, 1, 3, or 5 paper clips are put on the nose of a paper airplane, ***then*** the plane with 5 paper clips will fly the farthest ***because*** heavier things fly farther than lighter things. For example, I can throw a baseball farther than I can throw a ping pong ball.

Variables

In order to have a valid test, only the ONE variable, which is being tested, can be changed. That variable is called the **independent variable.**

The **dependent variable** is the number measurement of the change. You should have a way to NUMERICALLY measure the results of your test. (Grams, meters, pounds, feet, cups, hours, days, inches, pints, liters, etc.)

The other variables must not change, they MUST BE EXACTLY THE SAME for tall of the tests. These variables are called **constant variables.**

Sample Variables

(Think about our experiment at school)

The **constant variables** were: the same kind of plane, same size, same design of the plane, same throwing force and action, same size of paper clips.

The **independent variable** was the number of paper clips, 0, 1, 3, or 5, on the nose of the plane.

The **dependent variable** was the distance the plane flew.

On your boards, you will need to tell about your variables. Your information may follow this format:

The independent variable, which will be changed and tested is:

The dependent variable will measure the change by:

These constant variables for all the tests are the same:

Procedure

Write your procedure BEFORE you have performed your experiments. This helps to keep you focused while you're conducting the experiments. Do not use personal pronouns (I, me, we, etc.) in your list of steps.

The procedure has two main parts to it.

Materials: List all the materials you used to conduct your experiment.

Steps: List all the steps, in proper order, that you went through to conduct your experiment. Describe exactly what you did to perform your tests. Number the steps and begin each step with a verb. Remember to include recording the data you collected while performing your tests.

Sample:

1. **Construct identical planes to use in the experiment.**
2. **Attach appropriate number of paper clips for each trial.**
3. **Throw planes.**
4. **Measure distance of the flights and record data after each throw.**
5. **Average the results to summarize in the "Results" section of your display.**

Chart or Graphs

(you may choose either one)

Chart:

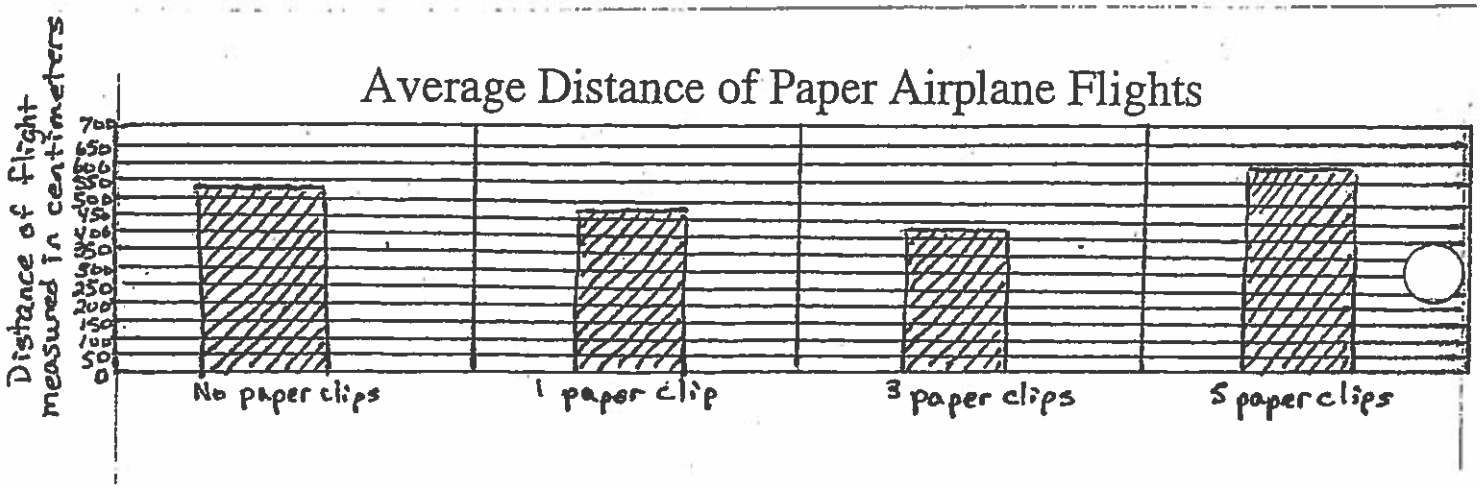
Design your chart according to the number of independent variables and the number of tests performed on your project. If you use more than one independent variable in your experiment, list them all in your chart.

Sample Chart
Flight Results
(Think about our experiment at school)

	Test 1	Test 2	Test 3	AVERAGE
No paper clips	500 cm.	515 cm.	612 cm.	541 cm.
1 paper clip	410 cm.	451 cm.	600 cm.	487 cm.
3 paper clips	312 cm.	477 cm.	507 cm.	432 cm.
5 paper clips	527 cm.	669 cm.	594 cm.	597 cm.

Graph:

Design your graph according to the number of independent variables and the kind of dependent variables that you used. List the independent variables for your project at the bottom of your graph. Place your dependent variable (measurement) on the left side of the graph. It is easier to graph the averages than it is to graph all the test results.



Results

In the results, GIVE ONLY THE AVERAGE RESULTS of the tests performed on each independent variable. To find the average, add up the test results for each independent variable, and divide by the number of tests that were performed. Even if you only have one independent variable, you should test it more than once. In this section you are really taking the results that you showed in your chart or graph, and writing it out *in sentences*.

Results

The average results for each independent variable are as follows:

The planes with 0 paper clips averaged a flight distance of 541 centimeters.
The planes with 1 paper clip averaged a flight distance of 487 centimeters.
The planes with 3 paper clips averaged a flight distance of 432 centimeters.
The planes with 5 paper clips averaged a flight distance of 597 centimeters.

Conclusion

In the conclusion, restate the hypothesis in the first sentence. You may start your next sentence with, "The results showed that my hypothesis was (or was not) supported." Explain *why* you think the hypothesis was or was not supported and give an example to support your scientific reasoning. Then, reflect on what you would do differently *next* time in order to achieve more valid results. What did you learn as a result of performing this experiment?

Never state that the hypothesis was proved to be true or false. A few tests cannot prove anything. It takes scientists many years of experimenting to "prove" something.

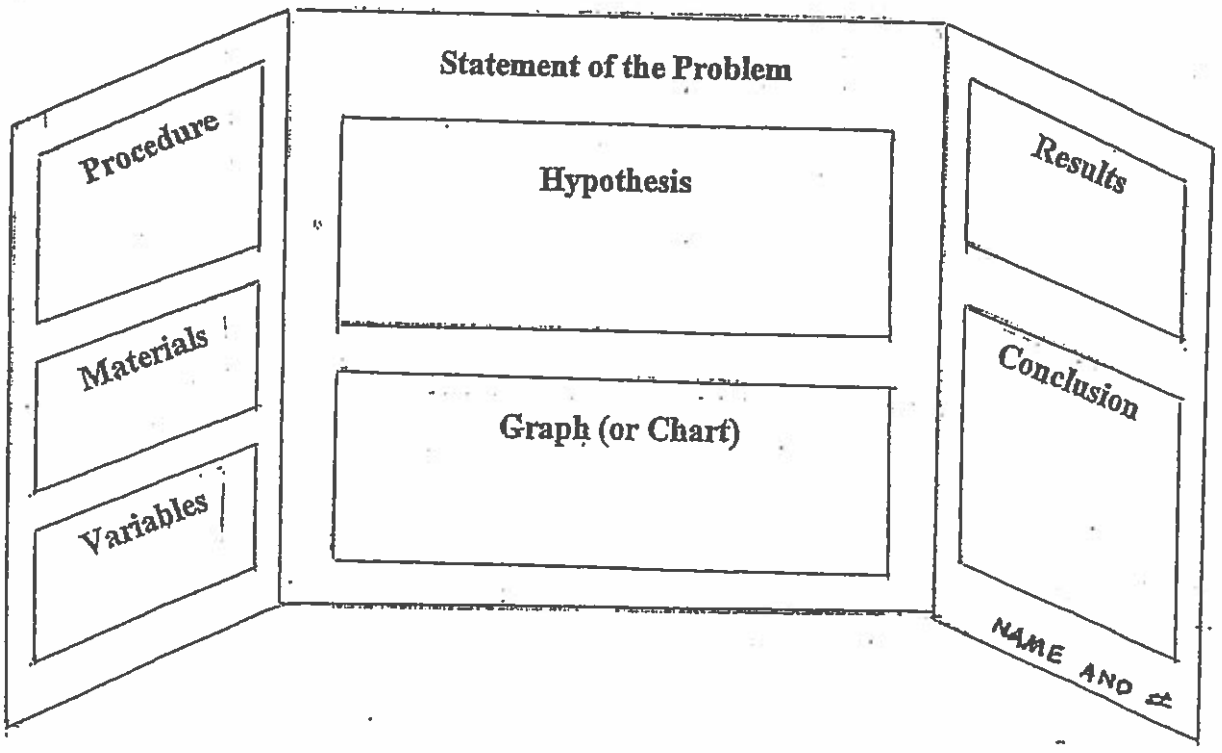
Sample:

The hypothesis was that 5 paper clips on the plane would cause it to fly the farthest because it would add weight and heavier things fly farther than lighter things. The results showed that my hypothesis was supported. The plane with 5 paper clips averaged the longest flight distances. I believe that the plane flew farther with five paper clips because the paper clips added weight which helped to guide it longer. For example, if I threw a ball, which has weight, it would go farther than if I threw a feather which is a much lighter weight. If I was to repeat this experiment, I would be certain to use the same paper clips and equal spacing of the paper clips on the nose of the airplane. I would also conduct more trials to see if my results stayed consistent.

Display Board

The display board should consist of three panels. The following headings are to be arranged in a logical order on the panels: STATEMENT OF THE PROBLEM, HYPOTHESIS, PROCEDURE, MATERIALS, VARIABLES, RESULTS, CONCLUSION. They should be positioned as detailed in the drawing below.

Everything about this science fair project board should be very neat and attractive. You might consider this to be an advertisement for your experiment. You may want to include experimental photographs or diagrams on your display board. Artifacts used for your experiment can be positioned in front of your display board to add interest.



Engineering/Science Fair Project

***use this as a guide through your experiment and then transfer the information to your board.**

What's the Problem

Problem/Purpose:

Write the problem in the form of a question. Remember the question mark.

_____

_____

Design

Hypothesis/Claim:

Write a statement of what you predict will happen in the "If...then" format.

If _____

then _____

because _____

What is your INDEPENDENT VARIABLE? _____

(the part changed and tested)

DEPENDENT VARIABLE? _____

(the part measured)

CONTROLLED VARIABLES? _____ _____

(the parts that stay the same) _____ _____

Materials:

List and quantify.

_____ _____

_____ _____

_____ _____

Create

Procedure:

Number the steps so procedure can be replicated easily.

1. _____
2. _____
3. _____
4. _____
5. _____

Repeat experiment **three times** in order to compare results.

Try it Out

Make a graph of your results. (this can be done by hand or computerized using https://nces.ed.gov/nceskids/createagraph/)

Results/Evidence: Write averages of results in sentence form.

_____
_____
_____
_____
_____
_____
_____
_____

Make it Better

Conclusion/Reasoning:

1) Rewrite your hypothesis in past tense using "when...then" format.

When _____

then _____

2) Was your hypothesis supported or not?

My hypothesis was _____

3) Describe any scientific principles learned.

I learned _____

_____

_____

4) Next Problem - another related experiment you could try or how could you make this experiment better.

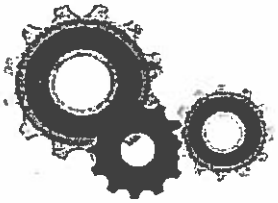
What if _____

_____

5) What's a real world problem that this could relate to and help solve?

_____
_____
_____
_____
_____
_____

Name _____



Engineering Fair Task Analysis

Statement of the Problem:

It is in the form of a question. (2 pts.) _____

Hypothesis/Claim:

Written in a full sentence with a good reason. If, then, because… (3 pts.) _____

Procedure:

Complete numbered steps of procedure listed. (5pts.) _____

Materials:

Listed (quantities if possible) (2pts.) _____

Independent/Dependent/Controlled Variables:

Fully explained (5pts.) _____

Results/Evidence:

Averages written in sentence form. (5pts.) _____

Graph:

Effectively displays data from experiment. Hand made or computerized (3pts.) _____

Conclusion/Reasoning:

Rewrite hypothesis in "When … then" format.
Tell whether your hypothesis was supported or not.
Tell what you learned.
Tell how you would change the experiment or what new experiment you could do. (5pts.) _____
What's a real world problem that this relates to and could help solve?

Display Board:

Neat, correctly spelled display with proper placement of all areas. (10 pts.) _____

Oral Presentation:

Eye contact, posture, volume, speed, organization (10 pts.) _____

Total (50 pts.) _____ x 2 = _____%

Grade _____

Science Project Ideas

(Not necessarily written in correct format as the statement of the problem)

How much salt does it take to float an egg?

Can the design of a paper airplane make it fly farther?

Does warm water or cold water freeze faster?

Do bigger seeds produce bigger plants?

Which materials absorb the most water?

What holds two boards together better--a nail or a screw?

Will bananas brown faster on the counter or in the refrigerator?

Does temperature affect the growth of plants?

Does a ball roll farther on grass or dirt?

Do all objects fall to the ground at the same speed?

Which paper towel is the strongest?

Which brand of batteries makes toys run longer?

Does water with salt boil faster than plain water?

Does the shape of a kite affect its flight?

Does an ice cube melt faster in air or water?

Does sugar prolong the life of cut flowers?

Will more air inside a basketball make it bounce higher?

Does the color of light affect plant growth?

Does the color of water affect its evaporation?

Do suction cups stick equally well to different surfaces?

Will water with salt evaporate faster than water without salt?

Which cheese grows mold the fastest?

Which brand of diaper holds the most water?

Does a baseball go farther when hit by a wood or a metal bat?

Does a certain material provide better insulation than others?

What keeps things colder--plastic wrap or aluminum foil?

Does heart rate increase with increasing sound volume?

Which grows mold faster--moist bread or dry bread?

Does the color of a material affect its absorption of heat?

Do sugar crystals grow faster in tap water or distilled water?

Choosing the Perfect Engineering Problem

Selecting an appropriate problem to investigate for the engineering fair is critical to your success. In essence, you must create something that solves a problem. All of the projects are expected to follow the scientific process where the results between two or more variables are compared and can be measured and graphed. Therefore, projects which only demonstrate a scientific principle like just making a solar cooker and explaining how it works are not permitted. Be sure to get your idea approved by your teacher before you begin your experiment. If you are struggling with selecting an idea, some examples of possible questions that would work for the engineering fair are listed below. Most importantly, select a problem that you are interested in. It will make eveything much more fun.

Engineer Fair Project Ideas

1. Which shape makes the strongest bridge?
2. Which material makes the strongest bridge?
3. Which type of pulley lifts the most weight with the least effort?
4. Which type of balloon will allow a hovercraft to float the longest?
5. Which shape of foil boat will hold the most weight before sinking?
6. Which type of paper will make a paper helicopter fly the highest?
7. Which location of a paper clip will allow a paper airplane to fly the farthest?
8. Which material will create boat that will hold the most weight?
9. What is the best material to use in sandbags to block water in a flood?
10. Which parachute design will fly the farthest?
11. Which design of Lego tower can withstand an earthquake?
12. Which wall design can withstand wind the most?
13. Which paper airplane design flies the farthest?
14. Which material makes the highest flying kite?
15. Which size of rubber band will make a rubber band car travel the farthest?
16. What type of blade design works best for windmills?
17. Which type of sound barrier reduces the most noise?
18. Which size of wheels on a mousetrap car go the furthest distance?
19. Which type of insulation keeps water hot the longest?
20. Which catapult design launches items the farthest?
21. What is the amount of water that will make a water rocket fly the farthest?
22. Will a bigger hot air balloon fly higher than a small one?