SCIENCE FAIR 101

What is a Science Fair experiment??

There are two types

1. **DEMONSTRATION**- a demo project **SHOWS** something. It is a display that shares information

_____ _____ _____

2. **EXPERIMENTAL**- this type of project **COMPARES** two (or more) things and shows how they react **DIFFERENTLY** to each other

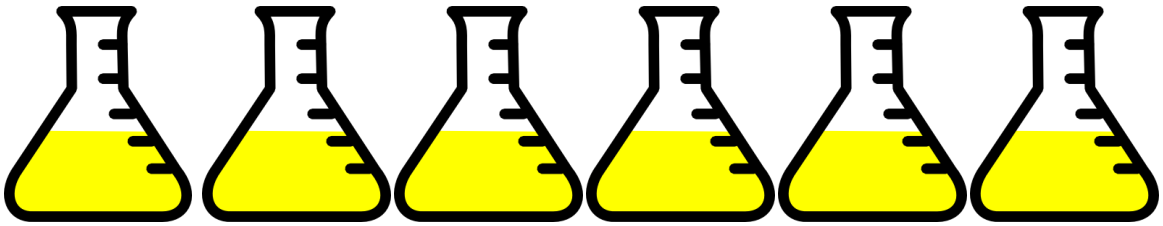
_____ _____ _____

Let's put the project letters in the correct category

A. A project on sea shells
B. Growing 3 plants in **different** levels of light and **comparing how tall** they grow
C. Growing 1 plant in the dark
D. A display on the solar system
E. Building 4 paper airplanes in **different** shapes and **comparing how far** they each fly
F. Measuring how long it takes 5 **different** liquids to freeze and **comparing the times**

Real science is done during an **EXPERIMENTAL PROJECT**, and that is what we are going to do together. We want to focus on **EXPERIMENTS**!!!

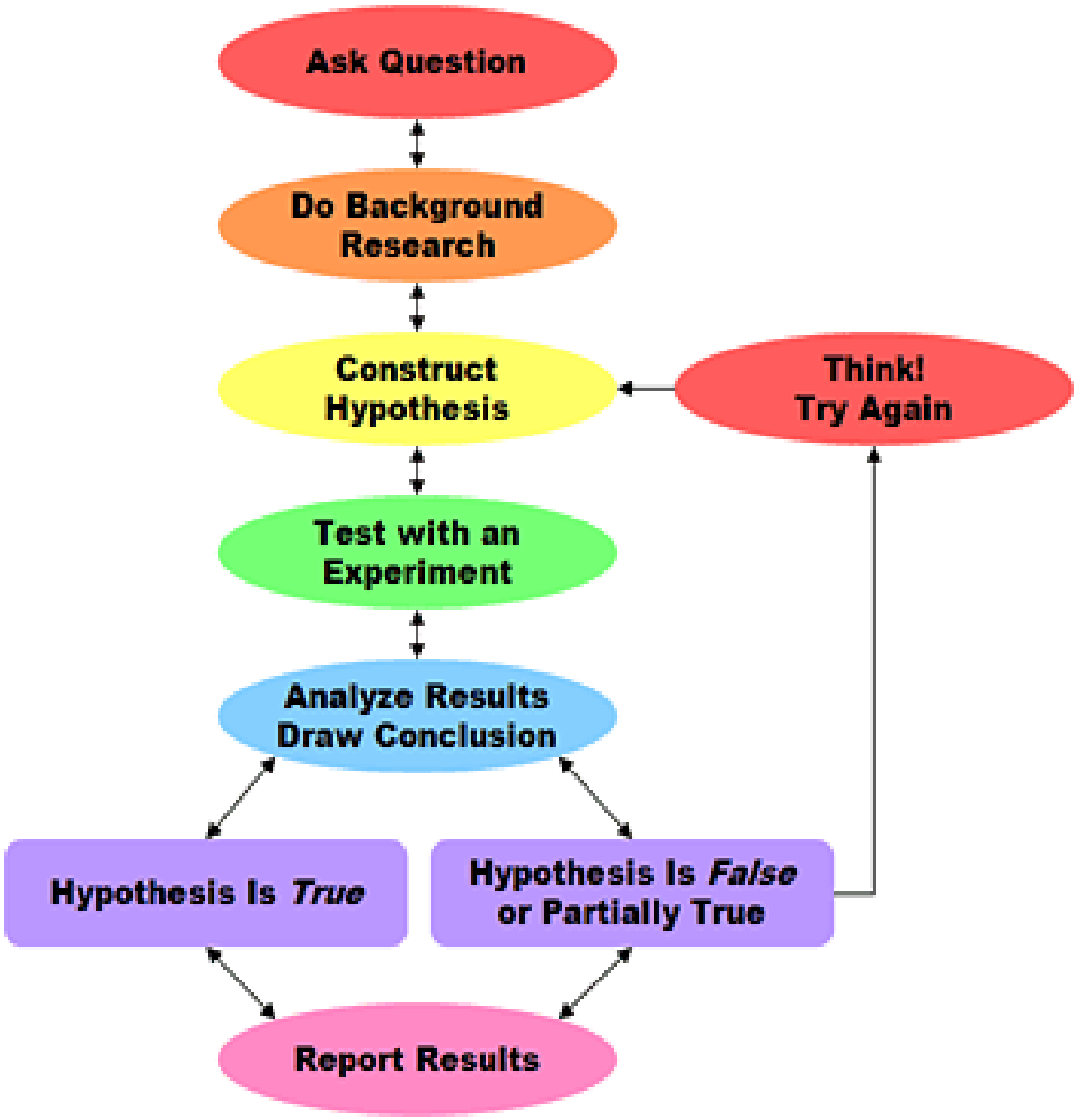
We are SCIENTISTS!!!



THE MAIN GOAL OF AN EXPERIMENTAL SCIENCE FAIR PROJECT IS TO ASK A QUESTION AND THEN TO FIND THE ANSWER. Pick an idea where you get to change one part of it and compare how that change affects your outcome. These are called your VARIABLES… we'll talk about that soon!

For many years, Scientists have been using **SCIENTIFIC METHOD** to help with their experiments and we are going to learn this too!

The **main** steps look like this:



We will be following this basic outline.

Here is a complete list of all the things you need.
Check the boxes as you finish them

- ☐ An EXPERIMENTAL project… are you COMPARING something?
- ☐ Question
- ☐ A Control Variable
- ☐ 3 Fun Facts
- ☐ Hypothesis
- ☐ Procedure List
- ☐ Observations
- ☐ Conclusions
- ☐ Extension
- ☐ Thank You's
- ☐ Bibliography
- ☐ Manipulated Variables (3)
- ☐ A Responding variable
- ☐ More Research
- ☐ Materials List
- ☐ Multiple Trials
- ☐ Graph/ Chart (with numbers and units)
- ☐ Application
- ☐ Sources of Error
- ☐ Report
- ☐ Display Board

**** We will go through these steps as a team!! ****

STEP # 1. Get a Log Book or Scientific Notebook

Every science fair project must include a logbook, also sometimes called a research notebook, which is a complete, permanent record of how you did your experiment/research project; it shows what you did and thought every step along the way.

LOGBOOK POINTERS:

- Write your logbook in a notebook (or on the extra sheets at the back of this booklet).
- Make an entry every time you work on your project.
- Date each entry.
- Make your notes in point form.
- Do not worry about neatness; you do not need to re-copy your logbook to make it look "tidy" .
- Organize your logbook into sections such as: schedule, daily notes and ideas, background research, contacts and references, experimental procedure/method, data collection sheets, observations/results in tables and graphs, conclusions.
- Write everything down, even if it seems insignificant at the time; the information may be useful later on.
- Make sure that you describe things in enough detail that you and anyone else reading your logbook in the future will be able to understand your thoughts and repeat the entire experiment exactly like you did it in the first place, just using your logbook.
- You must create your logbook as you go; it is unacceptable to create your logbook on the computer after you have finished your project.
- **NOTE: The text that appears on your backboard/tri-fold is just a summary of what you write in your logbook; there is much more information in your logbook than what appears on your backboard/tri-fold.**

STEP # 2. Picking a Question/Topic

Science is everywhere and you can build a really great project from really simple ideas!!
The easiest way to do this is to think about your hobbies or the things you are interested in.

!!!! YOU CAN PICK ANYTHING !!!!

Brain storm in the space below about the things you like to do or the things you find interesting (pick 10!!)

Take 4 of the hobbies/ interests that you like the best. Now I want you to think about at least 5 things that go along with them. For example, if you picked plants, what are the things you need to work with plants? You need seeds, soil, water, light, fertilizer, pots and a warm temperature! The list can go on!! What are the things you need for Hockey? Dancing? Music? Skateboarding?

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

Now look at all the ideas you already have!! Remember. You want to pick a hobby, change one thing about it, and compare how that thing changes your outcome.

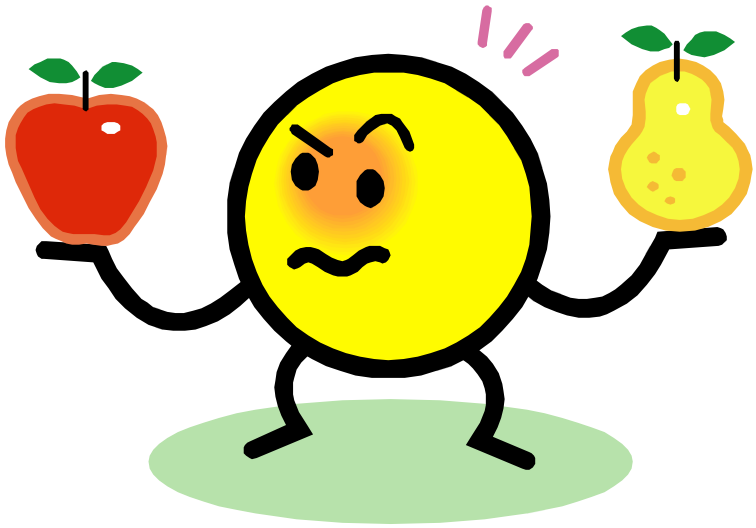
When you pick your question, I want you to think…

What's the one part of my hobby/ interest that I want to focus on?

Ex. Dance- do I want to focus on the type of floor I dance on, or the type of shoes I use?
Skateboarding- do I want to focus on the type of bearing grease I use, or the material the wheel is made out of?

To help you, I have put together a list of websites and a list of ideas at the back of this booklet to help pick a project question. Don't be afraid to change the idea to make it ALL YOUR VERY OWN**!!**

Remember you want to **COMPARE** something**!!**



Your question will be something that lets people know what your focus is.

Ex:

1. What type of floor is best for doing spins in dancing?
2. What type of wheel material will let me glide the furthest on one push?

Write down your question.

_____

_____

Science Fair Topic Ideas
Grades 4-6

Experimental Projects

Electricity

- Demonstration of principals; how is current affected by type of conductor, temperature, filament, etc.
- Compare electromagnets for strength, wires for conductivity.
- Principles of fluorescent lights; how do they compare with filament bulbs, in effectiveness and cost.

Chemistry

- Chemical Change and the factors that affect the rate such as heat. Light and catalysts.
- Acid and basic solutions, how are they produced, how can they be modified; practical considerations in soil, lakes, food; acid or basic solutions around the house.
- Factors affecting the making of glass.
- The effects of salts on the freezing point of water and other liquids.

Meteorology

- Day Length - record length of days and nights over a period of time; what effects do the changes have on things like household plants, pets, etc.
- Air Movement - Is air in your house the same temperature at floor level and near the ceiling? How could you spread heat more evenly through the house?
- Dew & - Does it form on clear or cloudy nights? What other
- Frost factors increase the amount of dew? Can you measure how much dew is formed in a square meter?
- Temperature - How does the temperature change during the day? What time is usually the warmest? Can you construct your own thermometer to keep your own records?
- Rain - How does a rain gauge work? Measure the rainfall over a period of time and compare it with the daily weather reports. - Principles of cloud seeding and other weather modification.

Biology

- Insect's -personal observations on life cycle, feeding habitats, population, flies, bees, butterflies.
- Nutrition - plants and fertilizer.

- Plants - why do plants grow towards light? - the effects of gravity on seed germination - how water moves through the plant - how plants reproduce and factors that affect the process - why do plants move?
- Soil - the importance of earthworms to soil and plants - the effect of soil components and organic matter on growth of plants.
- Field Studies - plant and animal life in the school grounds, a creek or stream, a grassy field, a tree, a home garden, a balanced aquarium, during winter. - diets of various animals.

Physical Science

- How metals compare in conducting heat.
- How metals compare in density and buoyancy
- Efficiency of different types of steam engines
- How does the amount of oxygen affect the rate of burning?
- Does temperature affect solubility?
- Are some substances more soluble than others
- How do airplanes fly? What is the best wing shape?
- How do waves carry energy
- How do magnets work? How are they made?
- Compare densities of different gases
- How light is affected passing through water e.g. viewing objects under water, formation of rainbows.
- What limits the speed of a boat, a truck transport?

Science Fair Topic Ideas
Grades 7-9

Engineering/Physics

- Use of solar energy- design and construct solar cookers, solar panels, etc.
- Designing a strong bridge, an energy efficient home.
- Efficient use of renewable energy resources- i.e. wood, wind.
- Determine the accuracy of various thermometers.
- How much heat is required to raise the temperature of various substances by an equal amount?
- Principle of energy conservation.
- Comparing active & passive solar energy systems in cost and efficiency.

Chemistry

- Effects of temperature on viscosity of oil, chemical reactions, Brownian movement, burning of different materials.
- Everyday activities that illustrate chemical principles.
- Chemical reactions that produce energy or that require energy.
- Testing of consumer products- glues, stain removers, antiseptics, mouthwash, detergents, paper towels, making salt water potable, removal of pollutants.
- Effects of sunlight on rubber, ink, paper.
- Effects of increased concentrations on the rate of chemical reactions.
- Compare the surface tension of various liquids.
- Analyzing snow and rain for pollutants; samples from different locations.
- Effects of temperature on density of gases.
- Effects of salt and other contaminants on rate of rusting.
- What effects do different amounts of exercise have on the production of carbon dioxide in humans?
- Analyze soil samples for their components, ability to hold moisture, fertility and pH.
- Does the amount of particle pollution vary with distance from a road, with location, with height? Determine types of particles found in pollution fallout.
- Catalysts- how they work and why; commercial applicants and problems.
- Fire extinguishers-principles of operation and factors affecting their efficient use.
- How do acids react with different metals under varying conditions?
- Electroplating- the principles, how different metals can be used and the practical applications.

Meteorology

- Snow- what happens when it melts; what does it contain; structure of snowflakes; life in a snow bank.
- Sky Colour- account for differences in colour at different times.

- Wind and Clouds- what are the common wind patterns in your area and why? Is cloud formation related to height, weather systems and temperature? Study and record how clouds relate to weather patterns.
- Water levels- study and record varying levels over the year in a body of water; account for differences and the results on the surrounding environment.
- Wind-does wind travel at same speeds and in same directions at different heights?
- Frost formation- what must the temperature be to form first; what are the effects of humidity? What is the make-up of frost and dew?
- Evaporation- which effects the rate of evaporation most- temperature, humidity, wind speed or other factors?
- Rain- can you measure the speed and force of raindrops? What is the effect on soil, with and without ground cover? Could you simulate the effect of rain?
- Heat Retention- does fresh water hold heat longer than salt water? How does water compare to land and what effect does this have on the weather? What factors affect the cooling of land?
- Sunlight- how do different surfaces affect the amount of sunlight reflected and absorbed?
- Humidity- can you collect the amounts of water in the air at different temperatures?
- Temperature- what is the difference between direct sun and in the shade? Is the difference constant?
- Weather records- Design and build an automatic recording weather device. Test it over a period of time.
- Effects of Humidity- what happens to hair during periods of changing humidity? How does human hair compare to that of other animals? How do other materials compare in expansion and contraction.

Biology

- Germination - how monocots and dicots differ - the effects of heat, light, carbon dioxide, pH level, etc. on germination rate.
- Photosynthesis - factors affecting the rate of photosynthesis temperature, light intensity, water, carbon dioxide - part of light spectrum used in photosynthesis.
- Leaf - do the numbers and sizes of stomata vary with different plants - what happens if stomata are covered and why.
- Roots - how much water is used by different plants - what is the effect of temperature, sunlight, etc., on the use of water (transpiration) - how do different types of soils affect the ability of roots to anchor plants - what factors encourage root growth and what is the effect of water, oxygen, soil type, minerals on root growth.
- Plant growth - determine the effects of various nutrients, amounts of water, hours of sunlight, strength of weed killer, temperature, pollutants, pH levels on plant growth and crop yields - can plants live without oxygen, carbon dioxide - what percentages of various plants is water.
- Genetic Studies - connections between hair and eye colour, sex and left-handedness, hair colour and strength - family studies on inheritance.
- Reactions of protozoa to changes in the environment.
- The preferred pH level in the soil for various plants.

Physical Science

- Fire and Burning- what factors affect burning?
- Fuels and their efficiency in producing energy.
- Musical instruments- the scientific principles behind them.
- Music vs Noise- difference.
- Pendulums- how can a period of a pendulum be increased?
- Air Pressure- Water Pressure.
- Gears- compare efficiencies, effect of different lubricants.
- Solar Furnace.
- Lenses- effects of curvature, materials on light beams.
- Can eggs withstand a greater force from one direction than from others?
- How strong are nylon fishing lines?
- How strong are plastic wraps?
- Which homemade airplane design flies best?
- What factors affect the bounce of a dropped ball?
- How do compression and tension make things strong?
- How strong is a toothpick?
- Which type of lawn sprinkler works best?
- Which type/size of light bulb produces the most light?
- How can the strength of light be measured? The effect on degradable materials.
- Which materials can be charged with static electricity?
- Which battery lasts the longest? How can power be increased?
- What affects light reflection? Refraction and diffraction of light?
- Spectrum and colour production- prisms.
- How is sound produced? What affects the pitch of sound? What affects the volume of sound? - How would you measure the velocity of sound?
- Magnets and electromagnets- what affects the strength of and electromagnet?
- Internal Combustion engines.

Science Fair Topic Ideas
Grades 10-12

Biology

- Plants in different environments (light intensity, colour).
- The effect of nicotine, air, yeast on mould growth.
- Factors affecting the strength of hair, the growth of bacteria, moulds or yeast.
- Experiment with Hydroponics.
- The effectiveness of Antiseptics and soaps on household bacteria.
- The effect of air pollution on algae, protozoa, fish, insects or mosses and lichens.
- The commercial uses of algae methods of production.
- Producing mutations in bacteria, yeast, protozoa or moulds.
- Best conditions for mushroom production.
- The effects of ultrasonic antibiotics temperature changes on bacteria count.
- Microbial antagonism.
- Reaction of paramecia, planaria to pH, light and temperature conditions.
- Plant tropisms and growth hormones.
- Transpiration rates for different plants and conditions.
- Using radioisotopes to study uptake of plant nutrients.
- Learning and perception in animals and humans.
- Studies of memory span and memory retention.
- A study of the relation between physical exercise and learning ability.
- Is audio or visual information better remembered?
- The effect of bleaching and dyeing on hair.
- A study of the percentage of DNA (by weight) in different species.
- Factors affecting the enzyme's reaction rates.
- Factors affecting seed germination (e.g. soil temperature, pH).
- Factors affecting flowering.
- Study of sterility in plant hybrids (F1 and F2).
- Comparison of different plant's ability to add humus to the soil.
- Factors affecting Nodule Formation in Legumes.
- Can household compounds (e.g. tea) be used to promote good health in plants?
- The effects of water impurities on plant growth.
- The effects of phosphates on aquatic plants.
- Effect of mineral deficiencies on protein content in soybeans.
- A study of the tumours produced in plants by agro bacterium tumifacieus.
- The effect of polarized light on plant growth directica.
- The effects of solar activity on plant growth.
- Tracing solar activity cycles in tree growth rings.
- The effects of electric fields on plants.

- The effects of magnetic fields on plant growth.
- Effects of magnetism on the size and frequency of blooms and fruits.
- The effects of X-Ray and other radiation on plants.
- Organic fertilizer versus chemical Fertilizer.
- Study of population fluctuations in insects.
- A study of toxicity of insecticides versus temperature.
- A study of stimuli that attract mosquitoes.
- The factors affecting the rate at which a cricket chirps.
- Study of insect of animal behaviour versus population density.
- A study of diffusion through cell membranes.
- Growth of plant and animal cells by cloning.

Engineering

- Design considerations for "Solar Heated" homes.
- Design considerations for "Solar-Cell" powered homes.
- A study of propeller designs for wind generators.
- Production of electrical energy from mechanical sources.
- Study of efficient home insulation.
- Comparing Insulative Properties of various natural and commercial.
- Insulators.
- The effect of landscaping and architecture on energy consumption.
- Efficiency studies on transformers.
- The effect of temperature on resistance.
- Study of formation of images on a T.V tube.
- Efficiency studies of L.E.D.'s (light emitting diodes).
- L.E.D illumination versus incandescent illumination in practice.
- Voice communication with infrared light and fibre optics.
- Find the maximum speed in fibre optic links.
- Study of various phosphors in fluorescent lighting.
- Structure versus strength in dams.
- Testing and comparing consumer products.

Physical Science

- Study of accuracy of calculators.
- The mathematics of snowflakes.
- Observational orbit determination of comets, meteors or other minor planets.
- The effect of solar activity on radio propagation.
- Observations of sunspots, flares and prominences.
- A study of solar flares through the sudden enhancement of atmospherics.
- The identification of elements in the solar and stellar spectra.
- Experimental exploration of the photoelectric effect.
- Experimenting with electron diffraction.

- Observations of magnetic permeability of different materials.
- Comparing magnetic pysteresis for different material.
- A study of radiation patterns from different antenna types.
- Factors affecting scent propagation.
- Factors affecting sound propagation.
- Factors affecting sound dampening.
- Index of refraction of liquids versus temperature.
- Index of refraction of liquids versus amount of additive.
- A study of infrared qualities of certain solutions.
- Crystal growth rates versus solution strengths, temperature, etc.
- Observation of freezing rates of water for different starting temperatures.
- Reproduce the Stanley Miller experiments "The Origin of Life".
- Find the optimal gas mixture for a Stanley Miller experiment.
- Experimenting with various separation techniques (e.g. electrophoresis).
- A study of catalyzed reactions.
- A study of saponification reactions.
- A study of esterification reactions.
- The physics of ski waves.

Earth Science/Meteorology

- Observations of experimentally induced seismic waves.
- Is there a relation between sunspot cycles and earthquakes?
- Observations of geomorphic factors in the local areas.
- Tracing glacial till fragments to local rock out drops.
- Exploring methods of controlling erosion.
- Fossil studies in limestone and other rocks.
- A study of phosphorescence as a tool for geologists.
- Comparison of the load bearing strength for different soils.
- Observations of fluctuations in stream flow following rain.
- Study of air tides: phases of the moon versus barometric pressure.
- Effects of weather on human emotions.
- Changes in snow density and other characteristics with time.
- The factors affecting ice patterns on glass.
- Study of the relation between wind direction and temperature inversions.
- A study of small scale wind currents around buildings.
- Observations of local anomalies in the earth's magnetic field.

Environmental Science

- The study of flora in a given region.
- Observations of urban wildlife.
- Study of adaptations of city flora to smog.
- An ecological study of the animal and plant populations occupying the same tree.
- The effects of crowding (with the same or other species) on a certain plant.
- Annual variations in the ecology of a body of water.
- A study of a shoreline.
- Observations of the spread of Dutch Elm disease.
- A study of the relation between soil type and vegetation.
- A study of the relation between vegetation and insects.
- Monitoring the changes in wildlife caused by human encroachment.
- The study of the impact of pollution on an ecosystem.
- A study of water pollution from feed lot farms.
- Tracing chemical (e.g. DDT) concentrations in successive food chain levels.
- Ozone destruction experiments.
- A study of air purification methods.
- Efficient methods of breaking down crude oil in seawater.
- Experimenting with microbial degradation of petroleum.
- Experimenting with biodegradability.
- Finding efficient methods of harvesting and using plankton.
- Find and ink that would decompose for recycling paper.

Computer Science

- Studies of storage/retrieval techniques for computer systems.
- Handling of data transfer between 1/0 devices.
- Data manipulation and information management techniques and procedures.
- Applications in education using the computer as an education tool.
- Compiler design.
- Statistics and random number problems.
- Simulation of nonscience areas e.g. history, life or other planets.
- A programmable processing unit design, function and operation.
- Developing a video game.
- Pascal programming tools.
- Developing a program to write a new custom program

STEP # 3. VARIBLES!

There are certain words scientists use to help stay organized. They will also help you decide which parts of your project you are **comparing** and which are staying the **same**.

There are 3 types of variables in EVERY experimental project; the **MANIPULATED**, the **RESPONDING** and the **CONTROL**.

Let's use an experiment from before as an example;
Ex. Building 4 paper airplanes in **different** shapes and **comparing how far** they each fly

MANIPULATED variable- this is the thing that you are changing, what are you making **different**

What is the **Manipulated** Variable?? _____
it is always best to COMPARE 3 types to your control

RESPONDING variable- this is the thing you are comparing. This is what you base your results on

What is the **Responding** Variable?? _____

CONTROL variable is the regular or normal way of doing things
hint what is the most common way to fold a paper airplane??

What is the **Control**?? _____

***

Now use YOUR experiment
Write down your hobby/ interest that you have decided to base your question on.

_____

MANIPULATED- The things you will be testing and comparing (3)

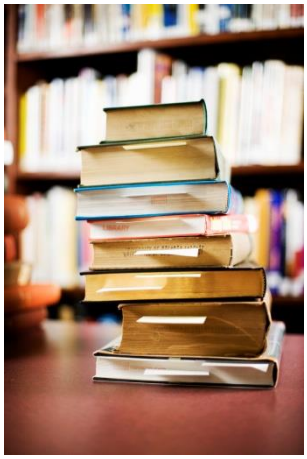
_____

RESPONDING - The part that you will be measuring

_____

Write down your **CONTROL** (the way you USUALLY do things or you can pick something to compare the rest of your results to)

_____



Step #4. BACKGROUND RESEARCH/ FUN FACTS!!

There is so much information on every topic, that looking through all of it is impossible.

Research your project and come up with some information for each main part.

***ingredients**, ***history**, ***how parts of your project are used**

Where are places we could find information??

1. **Libraries**
2. **Magazines**
3. **Internet**
4. **PEOPLE WE KNOW!!!** (Personal Interviews)
   Think!! Who do you know that may have information about your project? Or who can help you with certain questions?

Your research will show that you have studied your topic and it will help you make a **HYPOTHESIS**, which is an educated guess as to what the outcome of your experiment will be.

Let's go to the Library or on the internet and find 3 interesting fun facts about a part of your project**. REMEMBER!!** We need to keep track of where we got our information!!

How to Build a Simple Bibliography

1. **Book with one author**:
   Blodgett, E.D. Alice Munro. Boston: Twayne, 1988.

2. **Information from the Internet**:
   Include the web site address and the date you found the information.
   http://library.barrie.ca/children/ (January 1, 2001)

3. **Interview**:
   Delaney, Daphne (musician). Personal interview, Toronto, April 10, 2006.

You can find more simple bibliography outlines at
** http://library.barrie.ca/children/homework/bibliography.htm**

What are some parts of your project that you can research?? Brain Storm 10!! OR MORE!!!

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Fun Facts are a way to introduce your project, they are a quick way to give interesting information, and can save this list for ideas for the rest of your research!

Fun Fact #1

_____

_____

Website/ Name of Book-

_____

Fact #2

_____

_____

Website/ Name of Book-

_____

Fact #3

_____

_____

Website/ Name of Book

_____

These are just **FUN FACTS**… You will come up with more research as you move forward in your project. This is just a start!

Step #5. Forming your hypothesis!!

So far you have

- picked your project
- decided what to compare
- did your first bit of research

And now it's time to state your **hypothesis**!!

****

HYPOTHESIS is your educated guess, based on your research, as to what you think will happen.

Example: "**I think** paper airplane shape #2 will fly the furthest **because** I have learned in my research that a wider wing span helps keep airplanes in the air longer".

****

You now have 3 **manipulated** variables (the thing you are changing), your **responding** variable (the thing you are measuring) and your **control** and you get to guess which will work the best and why!

**** use the words " I THINK" and "BECAUSE"****

State your **Hypothesis**, you can change it when you do more research!

"I think _____

_____

_____

_____

because_____

_____

_____

_____"

Step #6. Building your experiment

There are two important lists that you need to keep track of during your experiment.

A. MATERIALS list

We keep a **material** list so that if a famous scientist were to try your experiment, they have all the items they need… just like the ingredients for a recipe.

Here is an example of a materials list:

- 4 pieces of the same paper (standard computer printer paper)
- Ruler and measuring tape
- Scissors
- Book of paper airplane shapes
- Large room with no wind or open windows
- Electrical tape

Think about how MUCH you will need (weight), WHERE will you get it and WHO will help you.

B. PROCEDURE list

We keep a **procedure** list so our scientist friend will know all the proper steps to take and in which order… the procedure list **is how to combine the ingredients!!**

Here is an example of a procedure list

The steps I took to do this experiment were:

1. I picked and folded my standard control airplane using the simplest and most common plane from my book
2. I picked 3 more different airplanes out of my book, all which only used 1 piece of paper
3. I put I piece of electrical tape on the ground and used this as the point where I would throw and measure from
4. I threw each plane and measured a straight line from where I threw to where it finally stopped moving
5. I measured from the front of the tape line to the part of the plane that was the furthest away
6. I recorded my findings on a chart and averaged the distances
7. I did **3 trials of my experiment** (each plane was thrown 3 times = total 12 throws) to get the best results

Record your **materials** and **procedure** on separate pieces of paper, you will write these out nicely for your report and your display board… we will talk more about that soon!

Let's take a minute to talk about **Multiple Trials**

Trials are a great way to confirm your results and allow you to ensure that your measurements are consistent (the same).

Ex. What if a stray gust of wind throws one of your airplanes a really long distance? Multiple trials will help prove to you that this it was just a stray gust of wind, and not the design, that made your airplane go extra far.

Trials let you prove that your results were correct.

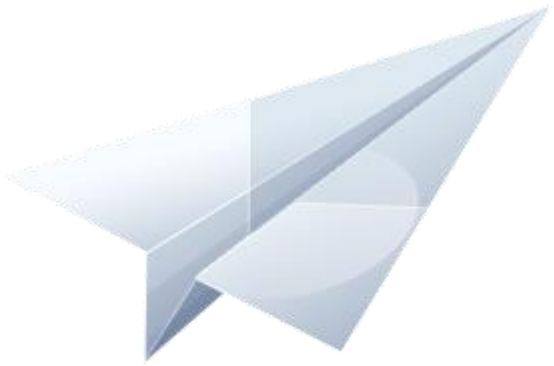
****Most simple projects can be done over and over quite easily****

Ex. **10 shots** with **each** kind of hockey tape = **10 trials**
5 attempts at doing the most dance spins with **each** type of shoe = **5 trials**
3 throws with **each** type of plane = **3 trails**

It is best to set up a simple chart to record your findings at first, and have a separate chart for each trial

Trial #1

Type of Plane	**Distance (m)**
Control	
Plane #A	
Plane #B	
Plane #C	



Trial #2

Type of Plane	**Distance (m)**
Control	
Plane #A	
Plane #B	
Plane #C	

Trial #3

Type of Plane	**Distance (m)**
Control	
Plane #A	
Plane #B	
Plane #C	

Step #7. Observations/ Collecting Data/ Results

Observations

1. Decide what you are recording as your results (circle one)

Time, Distance, Height, Temperature, Weight, Color, Smell, (other) _____

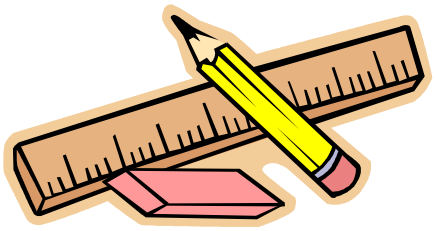
What information can you gather that best shows a change in your **Responding Variable??**

Collecting Data

1. How will you record your information? What tools will you use?

Stop Watch, Clock, Ruler, Measuring tape, Thermometer, Scale, Pictures, Video, Visual observations, (other) _____

What tool will best help you accurately collect your data?



Results ** STAY ORGANIZED**

1. How often will you record your results?

After each experiment, Every second, Every minute, Every hour, Every morning, Once a week, Once a month, (other) _____

2. How will you organize your results?

Graph, Chart, Pictures, Video, Written descriptions, (other) _____

There is a section at the back to help you with graphing and charting

Step #8. Conclusion

Your **CONCLUSION** is based on your **RESULTS** and **PROVES** or **DISPROVES** your hypothesis!!

All you have to do is answer your **QUESTION** that you started with.

1. Let us know what happened in your experiment.
2. Was your **HYPOTHESIS** proved or disproved?

"I have proved/ disproved my hypothesis, which was _____

_____

My results were _____

_____

and I think I got these results because _____

_____"

Try and come up with some reasons you think that you got the results that you did.

We have just completed the basic steps of our **Experimental Science Project**!!
Now we have to fill in some extras!

Step #9. Applications

Application means 'how does your experiment and results *apply* to real life?'

Think of how your information can help people and how they can use your information to make things better.

Ex. Knowing which material is best for dancing shoes will help dancers make the right choice

Knowing what hockey tape gives the best accuracy will help hockey players score the most goals

Come up with a reason why your experiment is important.

"My experiment applies in the real world because _____

_____

_____"

Step #10. Extensions

'Extensions' is how you could ADD to your project. Pretend that NEXT year you wanted to do science fair again, and you already have all this work done from THIS year's project… what could you add to your project??

Could you add more variables? Change which variable you are testing?

Ex. Since THIS year we found which dance shoe material was best, maybe next year, we would test more types of materials or experiment with the type of flooring material.

This year we experimented with the type of hockey tape, so next year we could experiment with different ways of wrapping the tape, or the type of stick we used.

**** Build On Your Experiment!! ****

Brain Storm

What are 2 extensions you could add to your project for next year?

1. _____ 2. _____

Step #11. Sources of Error

Sources of Error help explain where things could have gone wrong in your experiment.

Ex. Maybe the time of day affected how you were feeling and affected how many spins you could do in your shoes

Maybe you wrapped the hockey tape a different amount of times or maybe the stick you used was old or cracked.

**** Be Inventive ****

Brain Storm at least 4 "Sources of Error". Remember, be inventive and think of places where 'oops!!' could have happened… think of the gust of wind that blew the paper airplane super far…

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

Step #12. Thank You's

Every scientist has help and it is *VERY IMPORTANT* to let people know that you appreciate them.

Thank You's should be given to anyone that helped you… think of all the people that gave you their time, their information and their support.

**** Every great thing in the world has been done with a group, and it is important to acknowledge your team ****

Brain Storm below and think of all the people that helped make your project AWESOME!!

Step #13. Report/ Bibliography

Everything we have talked about has **TWO** places it has to go.

1. On your display board
2. In your report

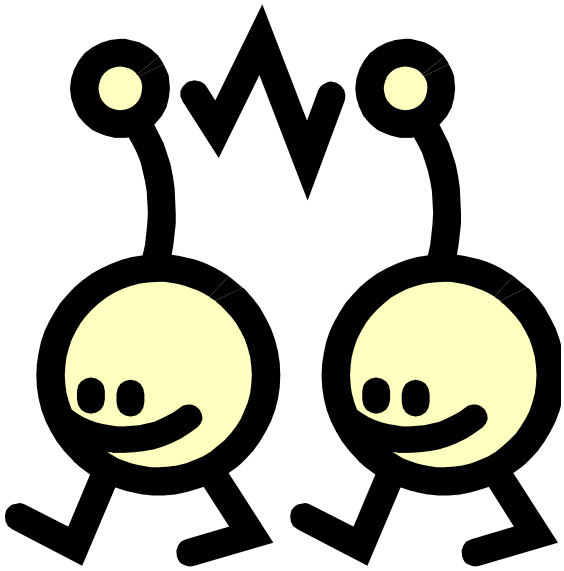
Your **display board** is so that people can come and look and see what you have done and get to ask you questions about your project.

Your **report** is so that if a famous scientist really wanted to learn about your project, but had to jump on a plane to Switzerland, they could take your report with them.

There won't be too much room on your display board so…

a. **FUN FACTS** go on your *display board* but **ALL YOUR RESEARCH** goes in *your report*
b. If your **PROCEDURE is really long**, put a *summary* of the *main steps* on your *display board*, but the entire **detailed procedure** in your *report*
c. Put **the titles of books, magazines and names of websites** on your *display board*, but the **DETAILED BIBLIOGRAPHY** goes at the *back of your report*

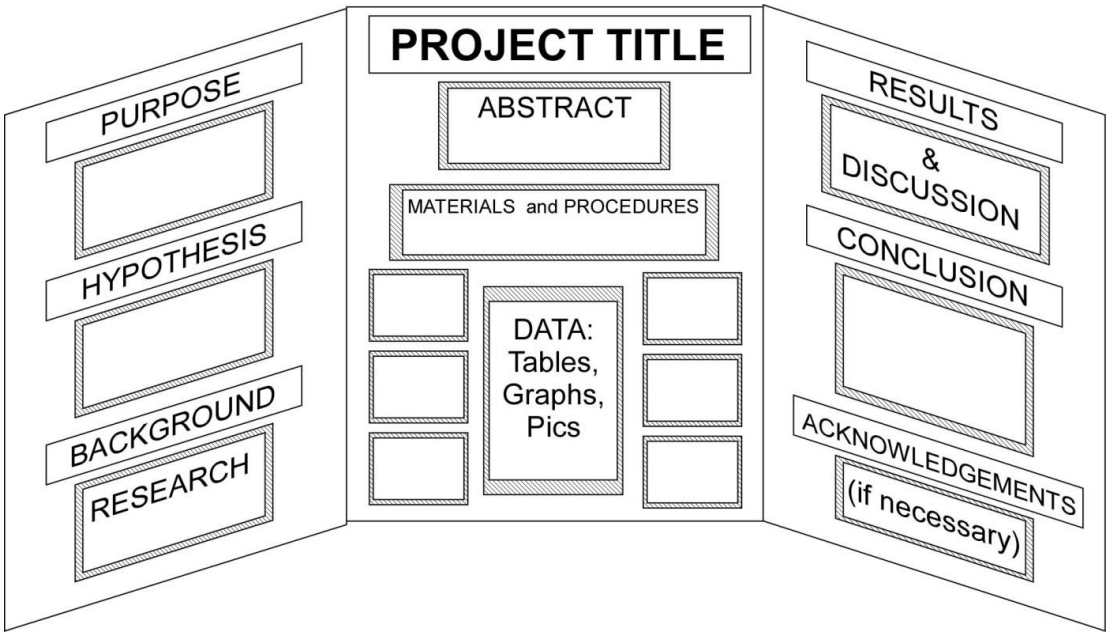
Basically, print everything twice; one for your board, and one for your report that a famous scientist could take with them.



The only thing extra thing your report needs is a really AWESOME title page!!

** YOUR DISPLAY BOARD!! **

Your display board is *ALL YOUR OWN*! You can use whatever decorations you want, construction paper, cut out lettering, sparkles, or whatever pictures you think will help it look wonderful!!



This is just an example of how you need to set up your board. You can organize all the things on the check-box list however you want

Keep it Neat!! And Organized!!

You can bring an example of your experiment to set up in front of your display board, or bring a laptop with a video on it too. This is your opportunity to bring your personal attitude to your project!!

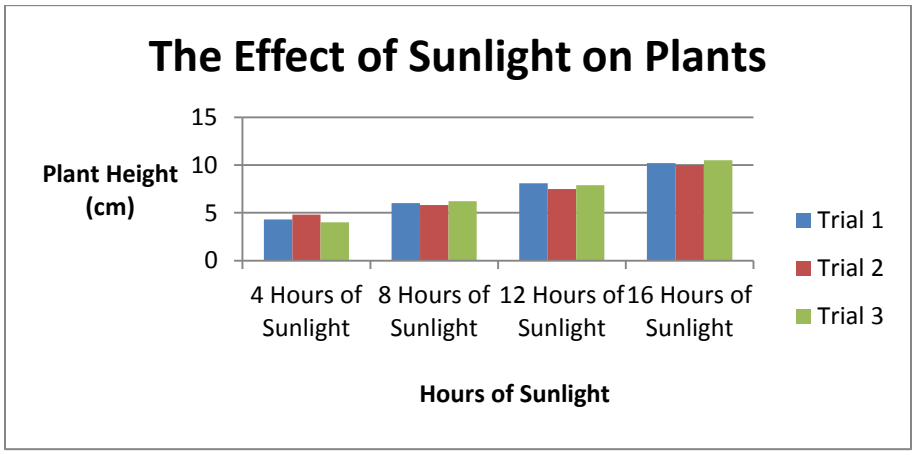
You can usually get project display boards form your local college, art store or office supply shop.

** BASIC RULES OF GRAPHING **

Charts and graphs are the most common and effective way to display the data you have collected from your experiment.

It allows you to organize your information in a manner that is

1. Simple to read and understand
2. Simple to explain
3. It looks very professional

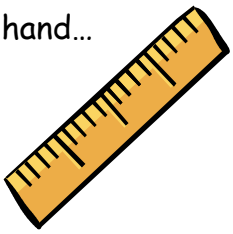


Graphing Rules!

- The bottom **'horizontal axis'** is your Manipulated Variable (HOURS OF SUNLIGHT). It is what you are changing.
- The left hand **'vertical axis'** is your Responding Variable (PLANT HEIGHT). It is what you are measuring.
- All graphs must have
  - a main TITLE (what is your graph showing?)
  - a title for each 'axis'
  - units… are you using 'hours' and 'cm', or 'type of fabric' and '# of spins', or 'type of hockey tape' and 'accuracy out of 10'?

Most computer programs can help you build graphs, but if you do it by hand…

**** USE A RULER ****



Judging Help Sheet

The last part of a Science Fair Project is competing in a science fair. This is your opportunity to show off all your hard work and all the new information you have learned… RELAX!!! Chances are, you will know more about your topic than anyone else and you will get to teach THEM!!

There are a few basic things you can do to prepare;

1. PRACTICE!!! Grab a friend or your lab partner and rehearse going over your project… step-by-step. If you have a lab partner, decide how you will share talking through the steps.
2. Try not to read off your board. Reading word for word will take a LONG time, so practice focusing on the main most important parts and give a summary of each section… if a judge has a question about something specific, they will ask… and if you lose your spot, go ahead and take a cue off your board.
3. Be polite. Introduce yourself and offer the judges a seat.
4. It's ok to say "I don't know", if a judges asks you a question, it's no big deal that you don't know the answer… not knowing and then finding out is the whole point!!
5. In the back of your log book or your report, have a section where you can write down tips from the judges… as you move forward to Regionals and Nationals, these tips may help you!!
6. Be sure to speak loudly and not too fast. It's ok to pause and take a deep breath if you feel nervous or need to think, remember that the judges need time to take things in too.
7. If you make a mistake, don't be afraid to correct it.

Here are some practice questions you can rehearse.

Sample Questions:

Where did you get the idea for this project?
If your project came from a webpage, it's ok to say so. If you DID change the project to make it unique, this is a great chance to let the judges know about your extra effort!!

If you could do this project again, what would you do differently?
Even if you feel everything went perfect, science is all about making improvements. Good answers could include performing more tests or trying a new material.

What problems did you run into and how did you fix them?
For most science fair projects it takes several tries to make a procedure that will work; tell the judges about any changes you made or obstacles you overcame.

What is one thing that surprised you throughout your research?
Did you learn something new from your science fair experience?

Did you do the experiment more than once?
Explain how you decided on your trial number.

What was your control?
Explain what you compared your results to and why.

How did you choose the materials used in your project?
For example: If you built a device out of Styrofoam, why did you choose that material?

Please show us your log book and explain how you organized it?
Judges want to see that it is neat and organized.

Did you have to take safety precautions?
The judges want to make sure your research didn't harm anyone or the environment.

ScienceFair101 : Resource List

The **ScienceFair101** team has put together a list of really great sites to get you started.

But be wise my young scientists!!

ScienceExperience101 crew has seen a lot of these experiments before!!! Be creative! Use these websites as a starting point and change the experiments to make them all your own... remember, you need to ***COMPARE*** something!!!

Make it work! You can do this!

ScienceBuddies@ http://www.sciencebuddies.org

CoolScience@ http://www.cool-science-projects.com/index.html

Discovery-ScienceFairCentral@ http://school.discoveryeducation.com/sciencefaircentral/Getting-Started.html

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

Education.com@ http://www.education.com/science-fair/

About.com@ http://chemistry.about.com/od/sciencefairprojects/u/sciencefair.htm

ScienceFairAdventure@ http://www.sciencefairadventure.com/

PlanetScience@ http://www.planet-science.com/categories/experiments/biology.aspx

MADSCI@ http://www.madsci.org

Do you want to know what it takes to get to the National Level?? See a complete list of **CanadaWideScienceFair** award winning projects@ http://cwsf.youthscience.ca/fair

How to Make a Bibliography

*Alphabetize by author's last name.
*If no author, go by the first main word of the title.
*Use the bibliography style that your teacher requests. If you are not given a particular style to follow, use the guide below.

1. **Book with one author**:
   Blodgett, E.D. Alice Munro. Boston: Twayne, 1988.

2. **Book with more than one author**:
   Elwood, Ann, and Linda C. Wood. Windows in Space. New York: Walker, 1982.

3. **Article in a magazine**:
   Daglish, Brenda, "A Matter of Interest." Maclean's, February 15, 1993, pp.36-37.

4. **Article in a newspaper**:
   Smith, Beverly, "Canadians Skate to Gold Medal," The Globe and Mail, March 11, 1993. p. A1.

5. **Article in an encyclopedia**:
   Humber, William. "Bicycling." The Canadian Encyclopedia, 1988.

6. **Video or Film**:
   Shooting Stars. Videotape. National Film Board of Canada (Toronto), 1987. 49 min., 30 sec.

7. **Radio or television program**:
   "Haida Gwaii – Islands of the People." Nature. PBS, December 19, 1992.

8. **Interview**:
   Delaney, Daphne (musician). Personal interview, Toronto, April 10, 2006.

9. **Information from the Internet**:
   Include the web site address and the date the information was researched.
   http://library.barrie.ca/children/ (January 1, 2001)

Source: http://library.barrie.ca/children/homework/bibliography.htm

Log Book or Scientific Notebook

Log Book or Scientific Notebook

Log Book or Scientific Notebook

Log Book or Scientific Notebook

Log Book or Scientific Notebook

Log Book or Scientific Notebook