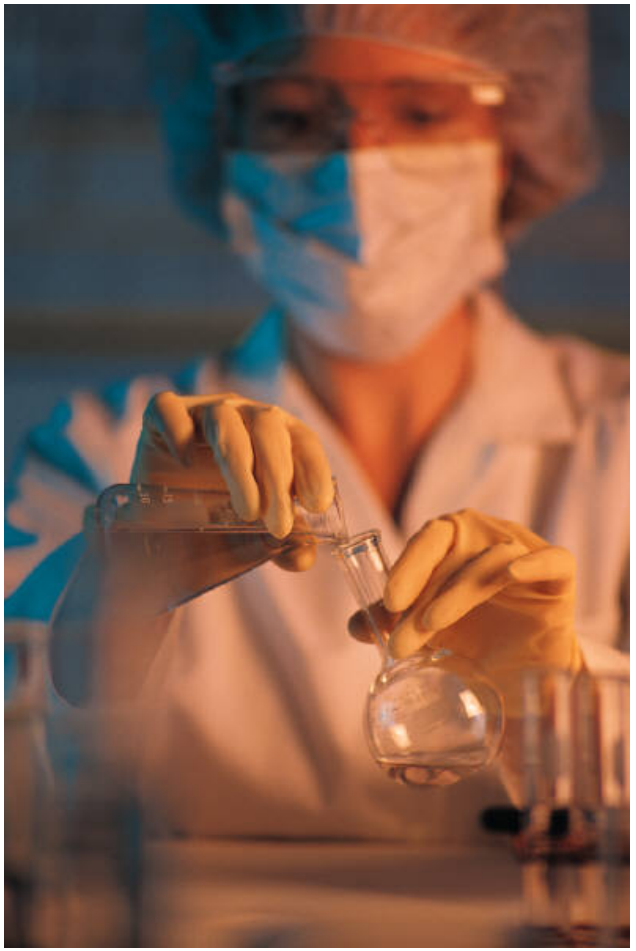
Doing A Meaningful Scientific Method Science Fair Project

The main purpose of science is to discover something or to find out why something happens and connect it to our world to solve problems and to understand our world a better.



The Scientific Method

These are the required steps
when doing a project using the Scientific Method.

- Purpose
- Research
- Hypothesis
- Experiment:
  - Write down the materials you will need
  - Write the step-by-step instructions you will follow
  - Write the variables of the experiment
  - Write what you see happening in the experiment (data).
- Analysis
- Conclusion

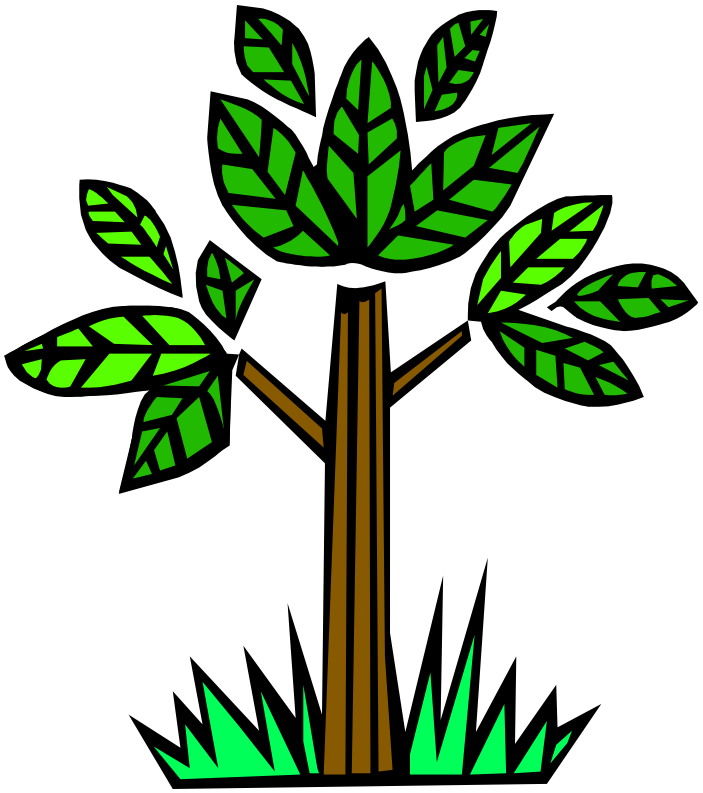
Other Things That are Required When doing a Scientific Method Science Fair Project

- You need to have a science fair journal that shows the work you did and your results following the scientific method.
- You need a display board that shows all the steps of the scientific method.
- An interview will be conducted to see if you can explain the scientific method in reference to the project.

How to prepare the journal, display board and for the interview will be shown later in this document.

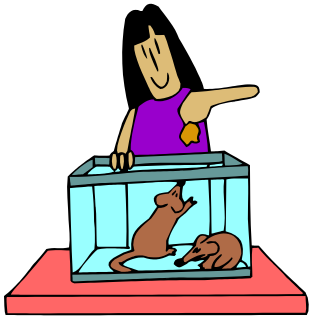
Choose a Subject You Are Interested In

- Earth Science
- Life Science
- Physical Science
- Chemical Science
- Consumer Science (Product Testing)
- Engineering Design
- Computer Design



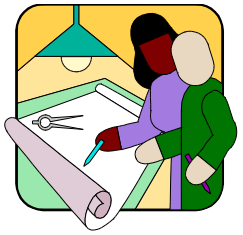
The Scientific Method Projects

- This scientific method will be used for the following projects:
  - Earth Science projects
  - Life Science projects
  - Physical Science projects
  - Chemical Science projects
  - Product Testing projects

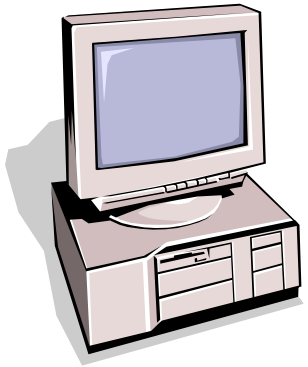


The Designing Method*

- The designing method will be used for the following projects:
  - Engineering Design



  - Computer Science Design



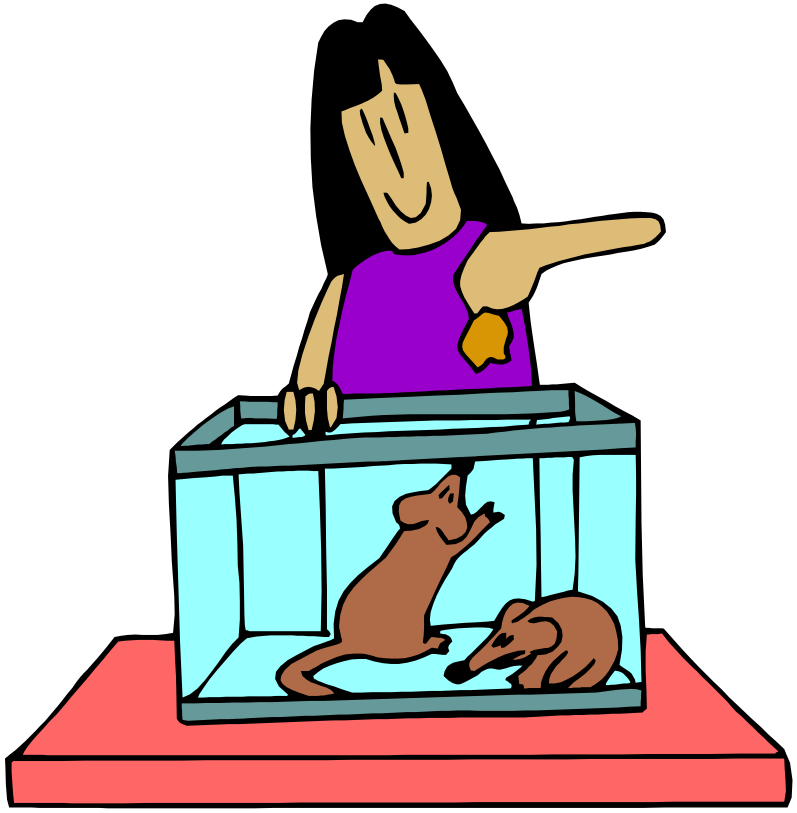
*The designing method is fully explained in another Power Point on the JSD Elementary Science Webpage. It will not be explained in this Power Point.

Earth Science Experiments

Volcanoes, soil, rocks, minerals, crystals, erosion, weathering, soil deposits, ocean water, earthquakes, fossils, water cycle, weather, air, water, wind, humidity, cold, heat.

Life Science Experiments

Animals, plants, insects, forests, deserts, grasslands, wetlands, food chains, plant cycle, ecosystems, animal behavior, human behavior, plant behavior.



Physical Science Experiments

Forces in nature—gravity, magnets, centripetal and friction; balanced and unbalanced forces; laws of motion; work; simple machines; forces in gases and liquids—pressure, buoyancy, and lift; energy—heat, light, sound, and electricity

Chemical Science Experiments

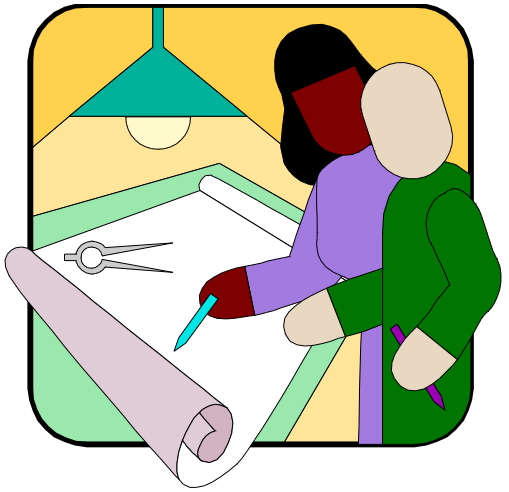
States of Matter--solids, liquids, and gases; mixtures, solutions and suspensions; chemical formulas, reactions, and equations; chemical and physical changes

Product Testing Experiments

Testing products such as popcorn, diapers, cereals, gum, soda pop, potato chips, stain remover, soaps, paper towels, bandages.

Engineering Design Method*

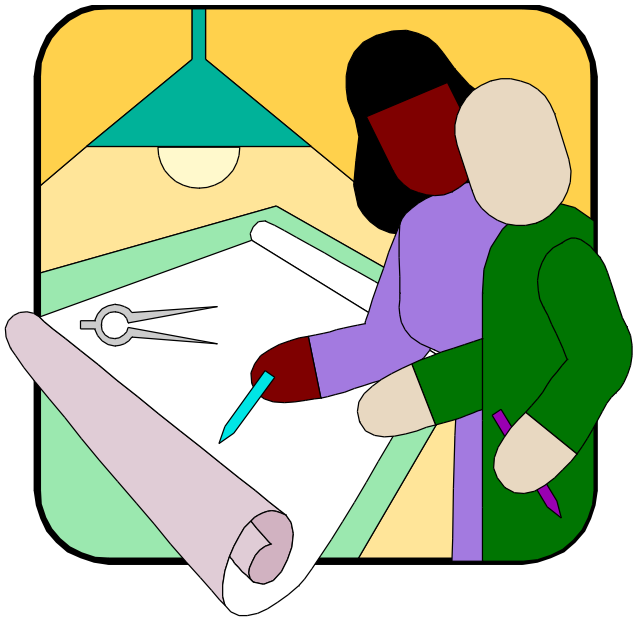
- Define a need for what you want to construct.
- Research your idea to learn what you need to do make a prototype.
- Establish the requirements needed for the development of the prototype--shape, size, width, appearance, physical features, performance, etc.
- Draw the beginning pictures showing what the design of the prototype will look like by labeling the parts and the labeling the measurements of the parts.
- Many beginning drawings should be shown. (Brainstorming)



*This is explained further in the
Engineering Design Instructional Power Point
On the Elementary Science Webpage.

Engineering Design Method*

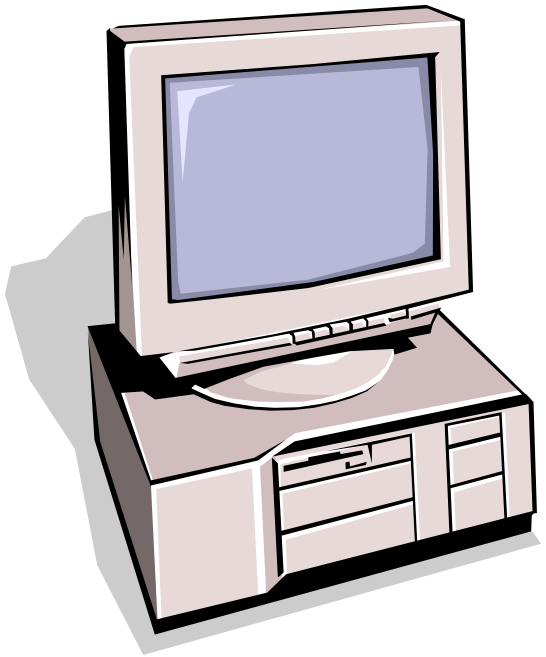
- Make a list of the materials you will need to build the model.
- Plan a step-by-step procedure you will use to build the model.
- Build the model with the directions you have planned.
- Test the model and write down what you see happening.
- Redesign with more drawings and retest.
- Keep doing this until you are satisfied.
- Write a conclusion what you learned and what your model does.



*This is explained further in the
Engineering Design Instructional Power Point
On the Elementary Science Webpage.

Computer Science Method*

- Define a need for the what you want to program into the computer.
- Research your idea to learn what you need to do understand your program.
- Establish the requirements needed for the development of the program code--memory needed, what it will do, performance, and accuracy
- Write the beginning program codes by brainstorming ideas to achieve the desired results.



*This is explained further in the Computer Design Instructional Power Point on the Elementary Science Webpage.

Computer Science Method*

- Many beginning codes should be shown.
- Program your computer with the code.
- Test your program and write down what happened.
- Redesign your code making adjustments to make it better and retest.
- Write a conclusion of your findings.

*This is explained further in the Computer Design Instructional Power Point on the Elementary Science Webpage.

Examples of Projects
"What can you do with….?"

eggs
water
flashlights
balls
straws
concentration
shoes
tastes
balloons
rubber bands
memory
newspaper
magnets
salt
colored paper
things that float
smells
different ages
ice cubes
blindfolding
bubbles
sponges
things that sink
music
coins
soaps
noise
marbles
voices
colors
evaporation
cotton
paper airplanes
dissolving things
animal tricks
small cars

The Scientific Method

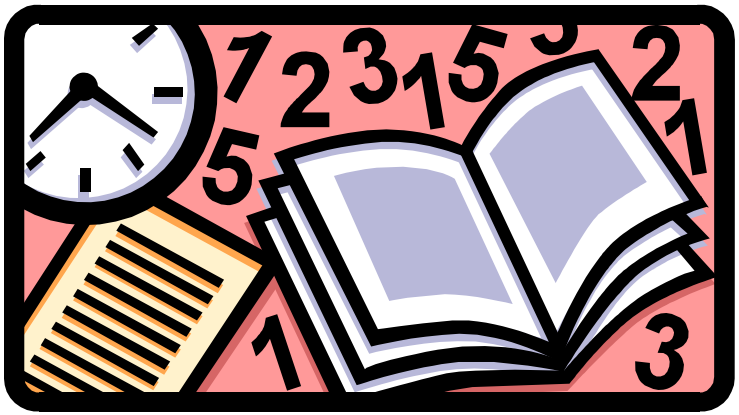
The next few frames explain the steps below of
The Scientific Method.

- Purpose
- Research
- Hypothesis
- Experiment:
  - Write down the materials you will need
  - Write the step-by-step instructions you will follow
  - Write the variables of the experiment
  - Write what you see happening in the experiment (data).
- Analysis
- Conclusion

The Science Fair Journal

Before you begin you need a journal.

- Science fair projects need to show a record of everything done by you as a "scientist".
- This record is kept in a journal, recording all the things you do each day you work on your project.
- You need a title page, table of contents, and bibliography in the journal.
- The table of contents will include all the steps of the Scientific Method.
- Be sure you date each day you work on your project.
- All measurements need to be recorded too.

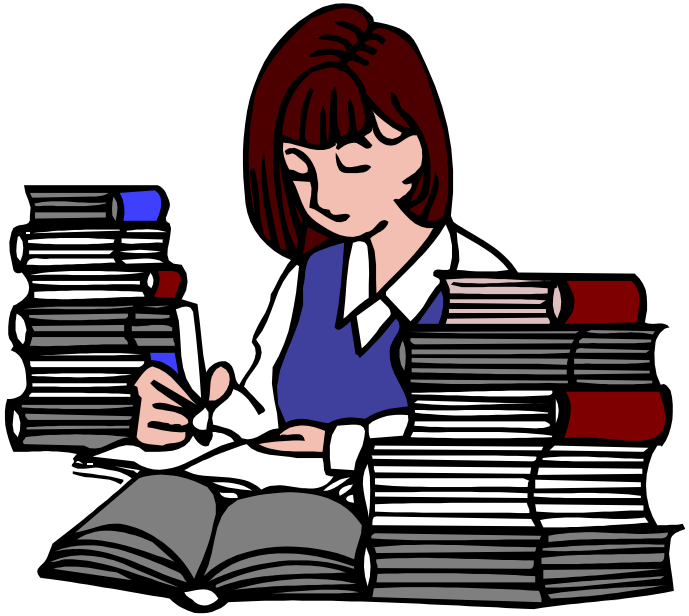


What is Your Purpose?

- The purpose shows that you are going to solve a problem. **Write your purpose in the form of a question in your journal.** This is what you want to investigate.

Research Your Topic

- Before you begin experimenting, you some background information by using some of these resources:
  - Encyclopedias
  - Science Magazines
  - Science Textbooks
  - Library Books
  - Internet
  - Interviews
  - Letters
  - Phone Calls
- You need to research your topic by using at least three resources.
- Record the information you learned about in your journal.



Make a Hypothesis

- You are ready to make a prediction of what you think the results of your experiment will be in your journal.
- Based on your research, what do you think will happen when you do your experiment?
- **You also need to put an explanation in your journal as to "why" you chose this hypothesis**.
- **Example:**

  Hypothesis:

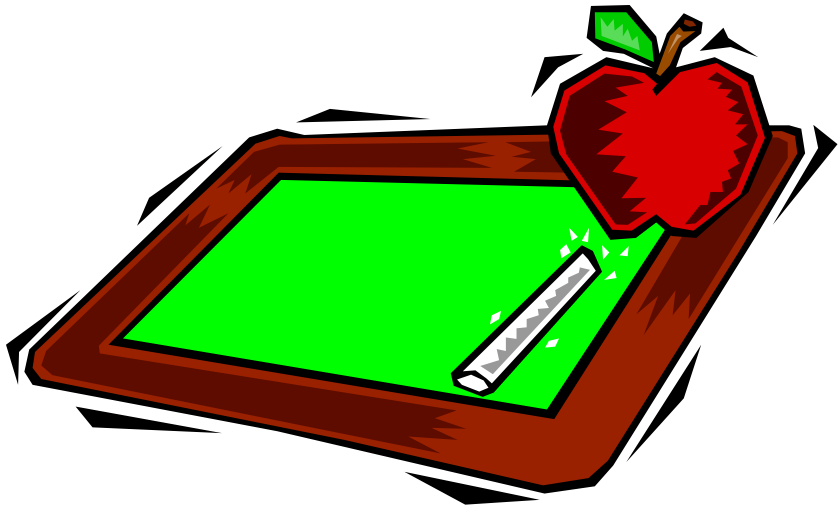
  When light shines on an object, the object will become hotter at a direct angle than on an indirect angle.

  Explanation:

  Light shining straight down covers a smaller area than shining on an angle. When on an angle, more heat is spread out causing less heat on the object.

The Experiment
List of Materials

- At this time you need to make a list in your journal of materials you are going to need for your experiment.
- Be sure to make your list very complete with describing words.
- Tell of all measurements and quantities you are going to use.



The Experiment
Step-by-Step Directions

- You need to write the directions of the procedure you are going to follow to do the experiment in your journal.
- These directions tell exactly the process you are going to follow as you do your experiment.
- As you write your directions in your journal, you have to be sure your test is fair. Keep all the conditions the same each time you do the experiment.

The Experiment
Controlled and Experimental Variables

- **"Variable"** means something can change. Everything around us has the possibility of changing so we live among variables. Variables are all the factors that have an effect on your experiment.
- You want to control most of the variable so they are called **controlled variables.**
- You only want to change one variable to have a different outcome each time you do your experiment. This is called the **experimental variable.**
- Write your controlled variables and the one experimental variable in your journal.

The Experiment
Gathering Data

- As you do your experiment, you are going to observe things happening.
  - Be sure to write down the data you are observing in your journal. This is your raw data.
  - Organize your raw data into a table in your journal.
- Be sure to collect sufficient data to make a reasonable conclusion.
- Test your experiment at least twice so it is valid.

Analyzing Your Data

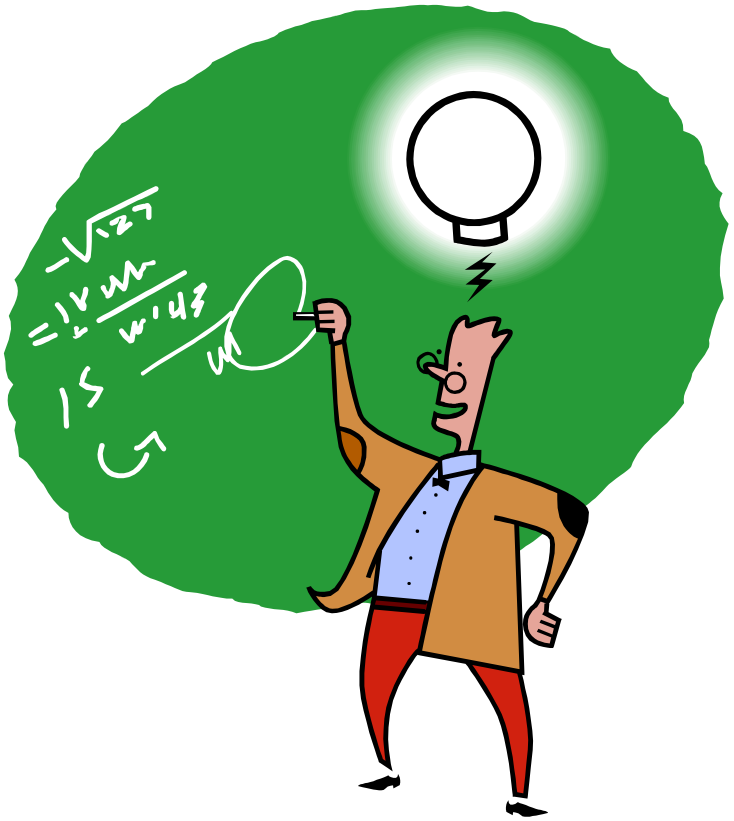
- **Make a graph using the data you collected from your experiment.**
- A graph is the best way to analyze your data as to what it means.
- On a graph the experimental variable is always written at the bottom.
- The data (measurements) you collected are always written at the side.
- Make sure the graph is easy to read.
- **Write a paragraph explaining what your graph means.**
- Be sure your graph and explanation of your graph is in your journal.

The Conclusion
What Did You Find Out?

Write about these ideas in your journal and anything else you can think of.

- Write if your conclusion agrees with your hypothesis.
- Write what you found out--in other words tell what the data means as it relates hypothesis.
- Write what you what you learned from your experiment.
- Write other questions you might have now.
- Write what you might do differently next time.
- Write what connection your results shows with a real world application which shows a transfer of knowledge.

Does what you write show evidences of learning?

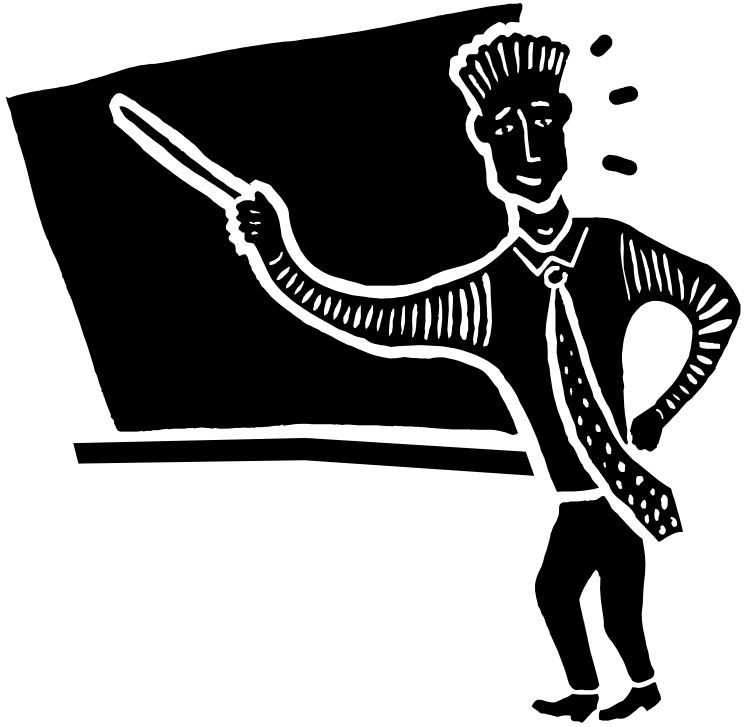


The Display Board
This is your Showcase!

You need a display board.

- All the steps of the Scientific Method should be on the display board except the research.
- Give yourself at least 1 week to make your display board.
- Make it:

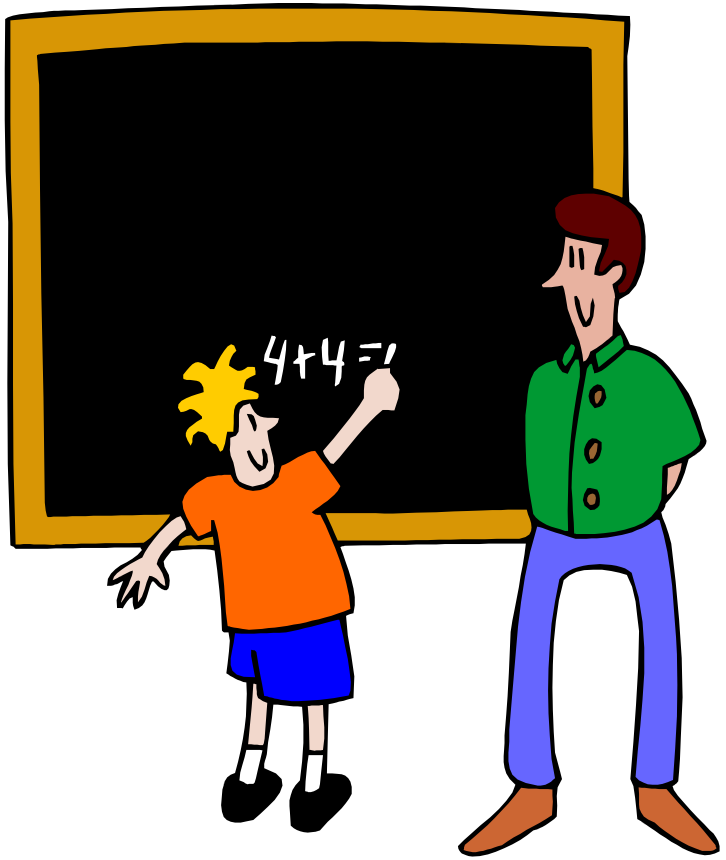
  Neat, Creative, Easy to Follow, Errorless (no scribbles), and Informative
- Your display board should reflect your journal but may not have as much information as your journal.



The Interview

You will be interviewed.

- Know these things:
  - Information you have read about.
  - All the things you did while following the scientific method.
  - What you learned from your project.
  - How the projects has helped you better understanding the world around you.
  - Other questions you now have.
  - What you would change next time if you did the project again.

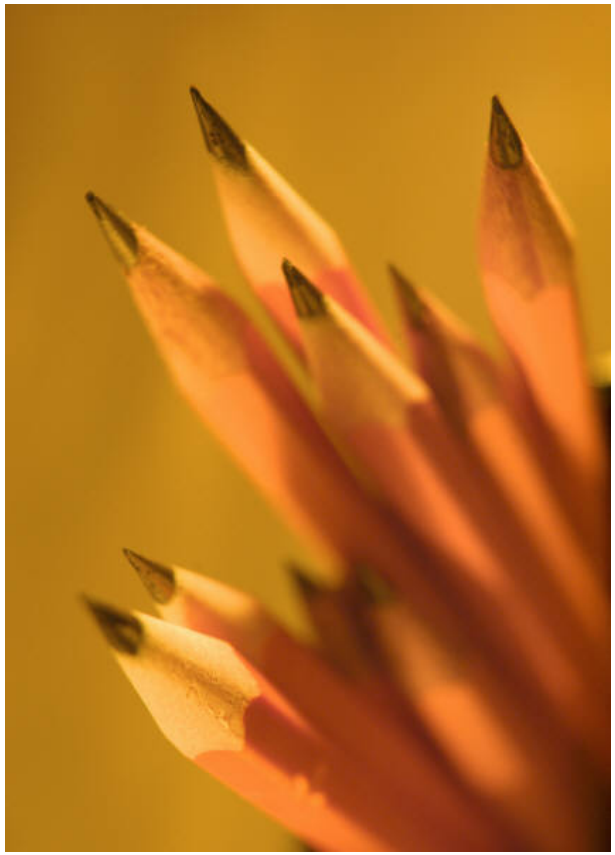


Thoroughness

- Follow through with these ideas:
  - Goals of the project
  - Creativity in the design
  - Clarity
  - Appropriate methods
  - Appropriate equipment
  - Appropriate grade level
  - Knowledge
  - Enthusiasm
  - Individual effort
  - Completed journal
  - Creative display board

2013-14 Science Fair Registration Form

- Before you begin your project for the school science fair, you need to fill out the 2013-14 Central Utah Science and Engineering Form.
- Filling out this form helps you know what you need to do to qualify for the school fair, district fair, and the Central Utah Science and Engineering Fair.
- It gets you started in the right direction.
- There are four pages to this form that needs to be filled out.
  - Page 1 Student and Project Information Page
  - Page 2 Science Fair Project Rules
    "Special Signature Page"
  - Page 3 Science Fair Project Research Plan
  - Page 4 Safety Rules and Signatures



Science Fair Rules

Some science fair projects may be dangerous to humans and animals. If your project includes any of the things written below, signatures must be obtained by professionals to make sure it is safe. These rules are set by the International Science Fair committee and need to be followed when doing a science fair project. **If these rules are not followed, the project will be disqualified for any science fair competition.**

1. Using Humans
2. Using Vertebrate Animals
3. Using Hazardous Substances or Devices
4. Using Bacteria, Mold, Fungi, Viruses, Parasites, Human or Animal Fresh Tissues, or Body Fluids
5. Using controlled substances

The following slides go into detail of the projects listed above and the signatures that need to be obtained to qualify to be in the school and district science fairs. Page two on the Science Fair Registration Form is for the signatures needed.

Also note: Growing any microorganisms must be done in a lab. Any microorganisms that are grown at home will disqualify the science fair project for any competition.

Some Science Projects Need Signatures

If you do a science fair project using humans you need approval and signatures from:

- **A school science teacher (your science teacher)**
- **A school administrator (your principal)**
- **A school psychologist (from your school), psychiatrist, a medical doctor, physician's assistant, or a registered nurse.**

Note: **If people are used who are under 18, you also need a parent permission signature for each person unless they are in your own family.**

Some Science Projects Need Signatures

If you do a science fair project using vertebrate animals you need approval and signatures from:

- **Two science teachers from your school**
- **A biomedical scientist (veterinarian in this case)**

Note:

- **Pets can only be used for these experiments and used for observational purposes only for behavioral study.**
- **There can be no pain or discomfort to the animal(s) during the experiment.**
- **Proper care must be provided at all times.**

Some Science Projects Need Signatures

If you do a science fair project using hazardous substances or devices (chemicals, firearms, welders, lasers, radioactive substances, radiation you need approval and signatures from:

- **Two science teachers from your school**
- **A school administrator from your school**

Note:

- **An adult must directly supervise the experiments.**
- **Adhere to federal and state regulations governing hazardous substances or devices.**
- **Follow proper safety procedures for each chemical or device used in the research.**

Some Science Projects Need Signatures

If you do a science fair project using bacteria, mold, fungi, viruses, parasites, human or animal fresh tissues, or body fluids you need approval and signatures from:

- **Two science teachers (from your school)**
- **A biomedical scientist (from a college or university)**

Note:

- **Elementary students cannot use blood in experiments.**
- **Organisms collected in petri dishes must be sealed, grown and stored only in a controlled place like a science lab under the supervision of a scientist. They cannot be grown and stored at home. They will be disqualified if they are grown and stored at home.**
- **Using plant parts, hair, sterilized teeth, and fossilized tissue in experiments need no signatures.**

Some Science Projects Need Signatures

If you do a science fair project using controlled substances (prescription drugs, tobacco, alcohol) you need approval and signatures from:

- **Two science teachers from your school**
- **A school administrator for your school**

Note:

- **An adult must directly supervise the experiments.**
- **Students must adhere to all federal, state and local laws when acquiring and handling controlled substances.**

For More Information and Help on Putting a Science Fair Project Together

You can visit the Central Utah Science and Engineering Fair Website at:

http://cusef.byu/edu