This handbook belongs to:_____

This handbook was created by the Powderhorn 2018 Science Fair Committee as a guide for students in preparing their Science Fair Project. The handbook contains information (Project Ideas, Tips, Resource Guide) that we hope will be helpful to you and your child in choosing and completing a project. We feel it is important to help your child find a project that is personally interesting to him or her. Direct your child to resources at libraries, on the Internet, at museums, etc., but let them do the work. We want the children to experience the **"WOW"** of science as well as learning the **"HOW".**

The Powderhorn 2018 Science Fair Committee

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The Science Fair Committee would like to give a special thanks to **The Powderhorn PTA for funding and organizing the Science Fair** and **all the faculty and staff at Powderhorn Elementary for their assistance.**

THANKS FOR YOUR SUPPORT!

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Bring out the scientist in you!
Begin planning your
2018 Science Fair project now!

Introducing Our Art & Science Fair

Dear Teachers, Parents and Students,

Powderhorn Elementary School will hold a Science Fair on Wednesday, February 28th, 2018. Our main objective is to promote enthusiasm and curiosity in children with an interest in the sciences - and to have them see science as an important part of their world. Doing a Science Fair project is an exciting opportunity for each student to take on the role of the scientist – to do what a scientist does and to learn something that the student does not already know. The Science Fair is voluntary and open to students in Kindergarten through Sixth Grade.

Although a science project allows an opportunity for the parents and children to work together, **the work should be done mostly by the child.** The student must be able to present the project to the judges both orally and as a display and be able to answer questions regarding the project. Parents can serve as a source of ideas, inspiration, and general information, guiding the child to find materials, and helping to determine the findings and results of the projects.

This will be a competitive science fair with all students receiving a ribbon for their project. There will be also be first through third place trophies given at each grade level.

Objectives of an Elementary School Science Fair

- ► To stimulate student interest in science and mathematics.
- ► To provide students with educational opportunities experienced through direct participation in scientific research.
- ► To publicly recognize the work that students have done by carrying out their projects to completion.
- ► To provide students with the opportunity to share what they have learned with other students and community members.

THE REWARD IS IN THE DOING

The objective of the Science Fair is not to win first place but rather to participate and have fun! This is a wonderful learning experience.

2018 Science Fair Schedule

Date	Time	Description
Starting Friday, January 12, 2018		Registration Forms will be distributed in Friday Folders and available through the PTA website. Registration Forms must be submitted by the deadline date. The Science Fair Handbook will be available on the Powderhorn PTA website.
Friday, January 12, 2018 Kick-off Assemblies		Science Fair Kick-off Assemblies.
Friday, February 10, 2018 Registration Deadline	**By 3:00 PM**	Deadline for registration. **No entries will be accepted after this date. You MUST be registered to enter the Science Fair.** Hand in registration forms to your teacher.
Wednesday, February 28, 2018 Science Fair Family Night	**8:00 AM – 8:40 AM**	Exhibitors check in and set up projects in the gym.
	9:00 AM – 11:00 AM	Exhibitors will report for judging at assigned time slots. Only exhibitors and judges will be allowed in the gym during judging.
	11:30 AM – 2:30 PM	Classroom viewing.
	6:00 PM – 7:30 PM	Powderhorn Science Fair Family Night. Come and see how your project did! The Science Fair is open to everyone for viewing. There will be visiting science presenters throughout the school.
	6:00 PM – 7:30 PM	Display takedown - **Please leave displays up until 7:00 PM for viewing**, after which all displays must be removed from the gym.

Project Categories

EXPERIMENT:

An experiment is a test or series of tests designed to find out something or to see whether a prediction is correct. Experiments always start with a question to be answered and allow you to pose a problem, design an experiment, record and report results and make conclusions based upon these results. The 6 step Scientific Method of investigation is used to find the answers.

- *Ask a question and state a purpose.* What do you want to see happen with your experiment? Which fabric allows the most moisture to pass through it? What brand of popcorn leaves the most unpopped kernels in the bag? Your questions are the purpose or reason for doing your experiment.
- *Research your topic.* If you need to know a little more before you make your action plan, now is the time to find out. For example, if you want to know what kind of cat food your kitty likes best, you may want to find out how many kinds are available and how much they cost before you decide which brands to feed her.
- *Make a plan and a prediction.* You will want to make a plan for finding out the answers. You will need to figure out what kinds of tests or experiments you could do, what steps you will take in doing those tests and experiments and what you think the results will be. A good guess or prediction of what you think will happen and how the experiment will turn out is called a hypothesis. Write down your hypothesis. Don't worry if your hypothesis turns out to be wrong. This happens very often to scientists.
- *Do the experiments.* Try to do a complete job in the time you have. Write down what happens at every step. Try to do your experiments more than once. To save time, you can do tests on more than one item at the same time. For example, if you are experimenting with plant growth under different lighting, you can grow several plants in a window, several in a closet and several under a lamp all at the same time. Then compare your results.
- *Write down everything.* Even if it doesn't seem important now, it might be helpful later when you are making your display. Remember to record all your tests, even the ones that didn't work. You can learn important things from your mistakes or from the unexpected.
- *Write a conclusion and an answer to your question.* This is where you say what happened and what you learned. If your results turn out differently than you expected, explain why you think that happened. You can still have an excellent project if you have given thought to the reason things turned out in an unexpected way.

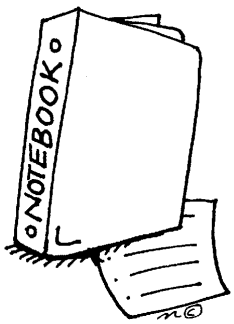
DEMONSTRATION:

Demonstrations should be based on a question about a scientific principle, a natural phenomenon, or a scientific instrument.

- In this category you might ask a question about how some kind of scientific apparatus or instrument, such as a thermometer, scale, or seismograph works. You could develop a model or display to go with your question and explanation.
- If you were interested in a natural phenomenon such as tornadoes or volcanoes, you could ask a question about why they form or what they do.
- You could also ask a question about a scientific principal, such as how do pulleys work to lift weights or how does magnetic force affect a compass needle?
- You could have a display of a skeleton or solar system and ask a question like how does a skeleton support a body or what makes the planets rotate around the sun.
- You could build a model of an airplane and ask the question what makes an airplane stay in the air?
- In this Science Fair category, you might also start with a question about how something such as a bicycle or wind up alarm clock works. Your display would explain the scientific principles that make it work.

RESEARCH:

Research is careful, patient study in order to find out facts and principles about some subject. Research begins with a question such as how do birds fly, what was Isaac Newton famous for, who were the pioneers in space, or how have computers changed since they were invented in 1946? If you decide to do research for your Science Fair project, your display might include some kind of written report of drawings with captions that describe your findings.



COLLECTION:

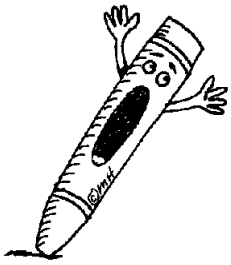
Collections are an assembly of items such as shells, rocks, or birds' nests that show variety and diversity within a chosen area. Collections make good science fair projects when there are scientific questions and investigations that go along with the display.

- How will you organize or categorize the collection?
- What properties could you use to identify, order, and classify the contents of the collection?
- What questions could you ask or investigate about your collection? For example, if you have a rock collection, you might ask if all rocks have the same hardness. You could make a prediction and investigate it using the rocks in your collection.

Project Tips

Scientists investigate to find the answers to questions and problems. They collect data and information and record and analyze their findings. Then they summarize their results and communicate them in a variety of ways such as written reports, graphs, charts, tables, drawings and oral presentations. Here are some steps you may find helpful in doing your project for the Science Fair.

- *Choose a topic.* Try one of the "Projects Ideas" in this handbook or brainstorm with your family. Choose something that is interesting to you.
- *Ask a question and write a title for your project.* All projects need to begin with a question. Your questions are the purpose or reason for doing your project. The title should describe the reason for your project.
- *Read, Explore, Think.* Write down everything you already know about your topic. Then ask others what they know. Read books. Gather as much information as you can. If you need to know a little more before you make your action plan, now is the time to find out.
- *Make a plan.* After you have your question, you will want to make a plan for finding out the answers. You will need to figure out what materials you will use, how much time you will need, how you will present and display your findings, etc.
- *Write down everything.* Even if it doesn't seem important now, it might be helpful later when you are making your display.
- *Organize your results.* Find a way to present your data or information so that other people will be able to understand what you've found out. You may need to use drawings, charts, tables, or graphs.
- *Write a conclusion and an answer to your question.* This is where you describe what happened and what you learned.
- *Make a display.* Remember your display is what the judges will see first. Your display should be neat, easy to read and understand. Your display should explain your project without you. Put your ideas in a logical order.
- *Plan your presentation.* Plan what you are going to say to the judges about your project. Be able to state your question or purpose and be able to explain your idea, what you did and what you found out. Think about what questions the judges might ask you about your project.
- ***HAVE FUN.*** This is very important. It's fun to challenge yourself and learn something new and interesting. You are in charge of the project! Be Creative! Enjoy it!



Project Ideas - Kindergarten through 2nd Grade

- Using prisms, bubble makers, mirrors or jars of water: show how rainbows are made.
- Make your own fossils with plaster casts. Explain what a fossil is.
- Show how a sundial works.
- How much salt does it take to float an egg?
- What kind of juice cleans pennies best?
- Which dish soap makes the most bubbles?
- Will plants seek light even if they have to grow sideways to find it?
- Can you tell what something is just by touching it?
- Can you tell where sound comes from when you are blindfolded?
- Can plants grow without soil?
- Does warm water freeze faster than cool water?
- In your class, who is taller, boys, or girls?
- Do different types of apples have the same number of seeds?
- Do bigger seeds produce bigger plants?
- Display a rock or fossil collection.
- Which materials absorb the most water?
- Make a compass using a magnet, steel needle and thread. Explain how it works.
- Make crystals with salt and sugar.
- Determine whether or not a dome is stronger than a cube.
- What materials dissolve in water?
- What is the soil in my backyard made of?
- Does holding a mirror in front of a fish change what a fish does?
- What color of birdseeds do birds like best?
- What holds two boards together better – a nail or a screw?
- Will bananas brown faster in the refrigerator or on the counter?
- Measure the amount of water in snow. Measure several storms.
- Does air temperature affect plant growth?
- Does a ball roll farther on grass or dirt?
- Do mint leaves repel ants?
- Do all objects fall to the ground at the same speed?
- Which travels faster – a snail or a worm?
- Can plants grow from leaf cuttings?
- Construct a detailed model of the Denver Zoo, showing the different habitats.
- Compare the predicted weather with actual weather.
- Make a diagram of the digestive system and how it works.
- Display pictures of herbivores, carnivores and omnivores. Label each and list the foods they eat.
- On which surface can a snail move faster – dirt or cement?
- Start a collection of rocks found in the area.
- What kind of objects can a magnet pick up?
- If seeds are frozen will they still grow?
- Do ants like cheese or sugar better?
- Can the design of a paper airplane make it fly better?

Project Ideas – 3rd and 4th Grades

- Will plants seek light even if they have to grow sideways to find it?
- Does warmth or light make a tulip open?
- Can you slow down the process of ripening bananas?
- How far does a snail travel in one minute?
- Do different soils hold different amounts of water?
- In your class, who has the biggest feet - boys or girls?
- Do plants grow bigger in soil or water?
- Does smell affect taste?
- Can you tell the time without a clock?
- Will more air inside a basketball make it bounce higher?
- Does the shape of a kite affect its flight?
- Do all minerals reflect light in the same way?
- Which will hold more weight, a simple beam bridge or an arched bridge?
- Which brand of popcorn pops the most kernels?
- Does baking soda lower water temperature?
- Does an ice cube melt faster in air or water?
- How does wing shape affect an airplane's flight?
- Which cheese grows mold fastest?
- How much of an orange is water?
- How much can a caterpillar eat in one day?
- Prepare an exhibit showing how the circulatory system works.
- In your class, who has the smallest hands – boys or girls?
- Use a model to explain contour lines on a map.
- Which kind of glue holds two boards together best?
- What percentage of time are local weather predictions accurate?
- How much time is our T.V. on?
- How much juice does an apple have?
- Do preservatives stop bread mold from growing?
- Which cleaner removes ink stains the best?
- Demonstrate how you can use straight lines to make a circle.
- What fabrics make good insulation?
- How are crystals formed?
- Explain how a "touch sensitive" computer screen works.
- Does a baseball go farther when hit by a wood or metal bat?
- Does fermenting yeast give off carbon dioxide?
- Prepare an exhibit showing why teeth decay.
- How does a pulley work to lift weights?
- How effective are antacids?
- Demonstrate why stars seem twinkle.
- How do temperature changes affect fish?
- Does a plant grow bigger if watered with milk or water?
- Does sugar prolong the life of cut flowers?
- Can you separate salt from water by freezing it?
- Does salt water evaporate faster than fresh water?

Project Ideas – 5th and 6th Grades

- Observe cloud patterns for several weeks and try to predict the weather. How accurate are you?
- What effect does size of particles have on the amount of solar energy it absorbs?
- Devise an experiment to show how water circulates through plants.
- Where do plants store starch?
- Are earthquakes correlated to sunspot activity?
- Will bread mold grow on something other than bread?
- Which metal conducts heat best?
- Do boys or girls have a higher resting heart rate?
- Can the sun's energy be used to clean water?
- Which way does the wind blow most frequently?
- Does the size of a light bulb affect its energy use?
- Are 5th and 6th graders are more aware of endangered species than adults?
- Make a model seismograph and show how this instrument works.
- For how long a distance can speech be transmitted through a tube?
- Does a green plant add oxygen to its environment?
- Does an earthworm react to light and darkness?
- Can you use a strand of human hair to measure air moisture?
- Design an electrical circuit that will set off a burglar alarm.
- Does sound travel best through solids, liquids or gases?
- Does the viscosity of liquid affect its boiling point?
- Devise a way to convert wind energy into electricity.
- Do sugar crystals grow faster in tap water or distilled water?
- How does running water affect the rate at which materials dissolve?
- How does wing shape affect an airplane's flight?
- Does the human tongue have definite areas for certain tastes?
- Does lung capacity differ depending on both size and the physical fitness of a person?
- What materials provide the best insulation?
- Is using two eyes to judge the distance more accurate than using one eye?
- Do taller people run faster than shorter people?
- What common liquids are acid, base or neutral?
- How can you find the height of a tree without climbing up and measuring it?
- Does heart rate increase with increasing sound volume?
- What keeps things colder – plastic wrap or aluminum foil?
- Do children's heart rates increase as they get older?
- What are the effects of chlorine on plant growth?
- Compare the anatomy of birds, mammals, and reptiles.
- Show whether earthworms can learn.
- How accurately do people judge temperature?
- What materials are biodegradable?
- Which grows molds faster – moist bread or dry bread?
- Does exercise affect heart rate?
- Is your dog right or left pawed?

Science Fair Resource Guide

Web Sites:

Jefferson County Public Library – http://jefferson.lib.co.us

From the *Home* page click on *Research Tools.*

From the *Research Tools* page click on *Subscription Databases A-Z.*

From this list you can scroll down and choose (among others)

1. *Access Science*
2. *New Book of Popular Science*
3. *Science Experiments Online*

You must have a library card to use as a password to access the databases above. Other free websites include:

Ask Dr. Universe	http://www.wsu.edu/DrUniverse
National Science Digital Library	http://www.nsdl.org
National Geographic for Kids	http://www.nationalgeographic.com/kids
How Stuff Works	http://www.howstuffworks.com
Cool Science for Curious Kids	http://www.hhmi.org/coolscience/
Fun Science Gallery	http://www.funsci.com
Explorer's Club	http://www.epa.gov/kids
Internet Public Library	http://www.ipl.org/div/kidspace/projectguide/
Bill Nye Online	http://www.billnye.com/billnye.html
Discovery School	http://school.discovery.com/sciencefaircentral
Weather Wiz Kids	http://www.weatherwizkids.com
Exploratorium	http://www.exploratorium.edu

Reference Information:

This is a list of call numbers and subject headings, prepared by the Jefferson County Library Staff to assist students in finding information on Science Fair topics.

Call Numbers and Subject Headings:

Science Exhibitions	507.8
Science Experiments	507.8
Science Projects	507.8
Science Reactions	507.8

For more subject specific experiments, use the word "experiments" in combination with a field of science (for example, **astronomy experiments or biology experiments**).

Reference Materials You May Find Useful:

Reference materials have an "R" or "JR" in front of the number, and are for use in the library only.

Science Activities from A – Z	JR 507.2
Science Experiments on File	JR and R 507.8
Science Fair Project Index, Cynthia Bishop	JR 507.4016
Science Fair Project Index, J.Y. Stoffer	R 502.8

Magazine and Newspaper Articles on this subject may be found in:

Print Indexes:

- Reader's Guide to Periodical Literature
- Children's Magazine Guide

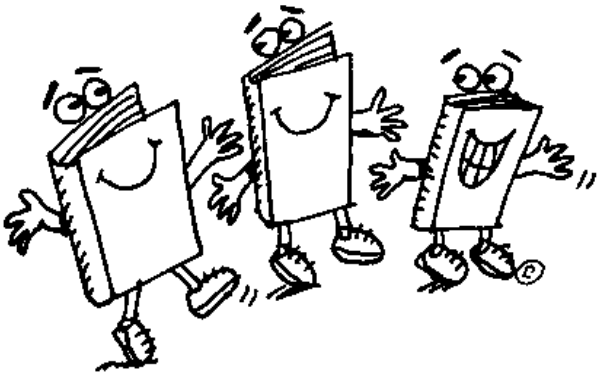
Computerized Indexes:

- InfoTrac
- Magazine Article Summaries
- Readers Guide with Abstracts
- General Science Index

Magazines:

- Discover
- Kids Discover
- Natural History
- Superscience Blue
- Superscience Red
- 3 2 1 Contact

This pathfinder is intended as a guide in your research. If you need additional information or assistance, please see a staff member at the Children's or Adult Information Desk.



Displaying Your Project

Whatever type of Science Fair project you choose, you will need to present your project in a uniform manner. Each project must be presented in a display unit (see below for details) must include the following information:

DISPLAY CONTENTS

- **Title of the Project:**
  The title should describe the reason or purpose of your project. It should be short, neatly lettered and easy to read.

- **Purpose/Question:**
  Every project needs a purpose! This statement lists your reasons for pursuing the project.

- **Materials:**
  This is a list of all materials and supplies used in the project. This may not apply to research projects.

- **Procedures:**
  This is the list or description of the steps that you used in the project.

- **Data/Observations/Results:**
  This would include any charts, graphs, pictures, drawings, diagrams or other visual data collected during the project. This is the information gathered during the project and should be included on the display units. This is where you would describe what happened, what you learned, and the answer to your question.

- **Bibliography:**
  This is necessary for research projects. This should list all the printed materials you consulted in carrying out the project, including web sites used. Items should be listed in alphabetical order. Any experts consulted should also be listed.

- **Exhibit Materials:**
  This would include materials used in the research or experiment, or the apparatus or collection you assembled. **No open containers of liquids. No hazardous materials! Nothing breakable! Anything in a container must be sealed with a lid or plastic.**

Display Unit

Figure 1 - An Example Project Layout

<u>You will have no more than 2 ½ feet in length for your display area</u>. The best display boards are the ones at Hobby Lobby or Michael's that are three sided. They are the most stable and look nice when set up.

The overall appearance of your final project should be something of which you can be proud. Allow some time to make your display colorful and interesting. A colorful and artistically arranged display will catch the eye of the judges at the Science Fair. Pictures, graphs and charts should be included on the display board.

Above is an example of a completed display unit. Your Science Fair project should resemble, but not necessarily be exactly like the example. You may construct your display in any way you choose; however, all the important parts (see the Display Contents section above) should be included on the display unit.

Remember – your display is what the judges will see first. Your display should be neat, easy to read and understand. Put your ideas in logical order. Your display should explain your project without you. You will be present during judging to answer questions about your project. Both your display and your interview with the judges will be considered in evaluating your project.

Rules and Regulations

1. All students are required to fill out a registration form and have it signed by a parent or guardian. If the student is working with a partner, both students must complete a registration form and have it signed by their parent or guardian. Projects are subject to the approval of the Science Fair Committee.

2. Students may work individually or in a team of no more than two students.

3. No live animals may be harmed or deliberately killed by the project.

4. No live animals may be displayed during the Science Fair.

5. No dangerous substances or unstable compounds may be used unless permitted by the Science Fair Committee, and they may not be displayed at the Science Fair.

6. No open containers of liquids. Anything in a container must be sealed securely with a lid or plastic. Nothing breakable!

7. No flames or fire may be used or displayed during the Science Fair.

8. No volcanic eruptions may be made at any time during the Science Fair.

9. Anything leaving the ground with force may not be demonstrated at any time during the Science Fair.

10. All projects must have a sturdy display board, and the project shall not extend beyond the dimensions of the board, generally 2.5 feet in length and no more than 2 feet deep.

11. Final projects shall be displayed according to the information provided by the Science Fair Committee.

12. All students are required to be present during the judging to answer questions about their projects.

13. All projects shall be removed after the Science Fair according to the timetable provided by the Science Fair Committee.

Please No Dangerous Compounds!

Judging Criteria

The Science Fair at Powderhorn Elementary is a competitive event. Each project will be evaluated and scored by a judge. The judge will look over each display and talk with the student(s) about what he or she did and what they learned. Students should have a good understanding of their project and be able to answer questions about it.

Judges will evaluate each project on the following:

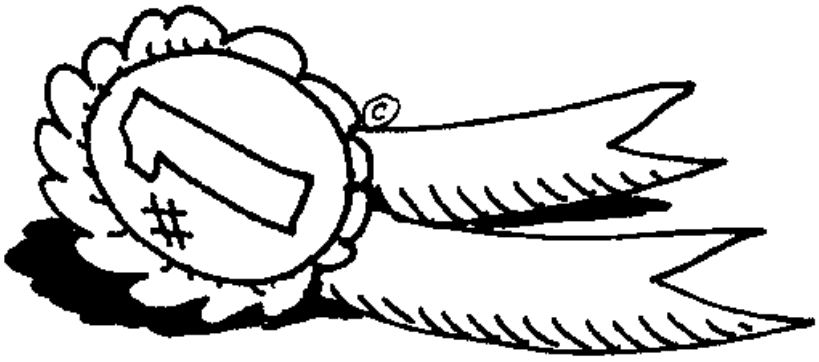
1. **STUDENT'S UNDERSTANDING OF THE PROJECT**
   Can the student explain the project's theory? Can the student describe how the results were achieved and what was learned? Does the student understand everything that s/he did?

2. **THOROUGHNESS**
   Is the information correct? Does the display answer a question, prove a point, or demonstrate a scientific principle or theory? Did the student keep a notebook? Are the research sources listed? Did the student use the Scientific Method of investigation for his/her experiment?

3. **PRESENTATION**
   Is the display neat and understandable? Are the items are set up in a logical and attractive format? Does the display illustrate the important ideas in the project?

4. **ORIGINALITY and CREATIVITY**
   Does it demonstrate a unique point of view? Are they your ideas? Project appeal. Be as creative as you can be!

This will be a competitive science fair with all students receiving a participant award for their project. There will be 1st through 3rd place trophies at each grade level and ribbons for all participants.



POWDERHORN SCIENCE FAIR JUDGING FORM

OVERALL SCORE: _____

SCORING SCALE:

4 - Exemplary quality for student's age/grade level
3 - High quality for student's age/grade level
2 - Average quality for student's age/grade level.
1 - Below average for student's age/grade level.

UNDERSTANDING (40%): overall for category _____

____ Student can explain the purpose of the project in his/her own words.
____ Student can describe the methods used to achieve the stated purpose or answer the question(s) posed.
____ Student demonstrates understanding of entire project.
____ The project is at the appropriate level of difficulty for this student's level of knowledge.

THOROUGHNESS (30%): overall for category _____

Required elements are present:

____ Title
____ Purpose or question clearly stated
____ Methods (and materials, when relevant)
____ Supporting data/observations/research
____ Conclusion consistent with collected data
____ Bibliography

PRESENTATION (20%): overall for category _____

Quality of exhibit display:

____ Display is on appropriate display board.
____ Display is neat and easy to read and understand.
____ All elements essential to understanding the entire project are present.

ORIGINALITY AND CREATIVITY (10%): overall for category _____

____ The project demonstrates an original idea or point of view.
____ The student demonstrates advanced level of thinking in project design or presentation.
____ Project has special appeal or evidence of unusual creativity.

*Projects must be student work, not parent work.

Two positive comments:

One positive suggestion:

Checklist of Things to Do

- ☐ Select a Topic/Form a Question
- ☐ Title of Project
- ☐ Read, Explore and Think
- ☐ Plan Your Procedures
- ☐ List of Materials Needed
- ☐ Organize Your Results: graphs, tables, pictures, etc.
- ☐ Conclusions/Answers to Your Question
- ☐ Make a Display
- ☐ Plan Your Presentation for the Judges
- ☐ Have Fun Learning Something New