Webster Elementary School
Science Fair & Exhibition

2020
Resource Guide

~ IMPORTANT DATES ~

Science Fair & Exhibition
Kick-off Assembly
Monday, January 13

Final Submission Date for Participation Forms
Thursday, February 20

Turn in Completed Projects
Monday, April 20
(3 – 6 p.m.)
OR
Tuesday, April 21
(7:30 – 8:30 a.m.)

Science Fair Project Judging AND
Science Exhibition Project Presentation
Tuesday, April 21 (during school)

More details to come on the family viewing of projects and celebration!

Welcome to Webster's Annual Science Fair & Exhibition!

The guidelines below are designed to make the Science Fair & Exhibition fun, as well as a tremendous learning opportunity for your child. All projects must follow the guidelines. Please take some time to carefully review them and help your child choose an entry which satisfies both curiosity and creativity.

All Science Fair & Exhibition projects utilize the Scientific Method and include some type of display, and perhaps a model. The following is a brief overview to get you and your child started in determining what type of project your child would like to work on, and whether or not your child elects to be judged in the Science Fair or simply displays their project in the Science Exhibition.

Remember, the Science Fair & Exhibition is first and foremost about LEARNING. We learn many different things in science. We learn how to make a hypothesis and how to test it. We discover that if our hypothesis is not supported by our research, that's okay, because we still learned something. No one loses if everyone learns. Most importantly, remember to HAVE FUN!

Table of Contents

CHOOSING A SCIENCE FAIR & EXHIBITON PROJECT

Before filling out your Science Fair & Exhibition Participation form, you must consider the type of project you want to do, and whether or not you want your project to be judged.

DETERMINING THE TYPE OF PROJECT

There are three types of projects: Investigations, Demonstrations, or Experiments.

An **INVESTIGATION** is thinking of a scientific question or topic and then find more information about it by doing research. The Scientific Investigation Method includes: Question, Research, Conclusion. Investigations may not be entered for judging.

> For more complete information regarding Investigations, please refer to "How to do an Investigation" beginning on page 4 of the Resource Guide*.

A **DEMONSTRATION** illustrates a scientific principle or concept. Some sort of model or apparatus is used to show how the scientific principle works. The Scientific Demonstration Method includes: Introduction, Procedure, Results, Conclusion.

> For more complete information regarding Demonstrations, please refer to "How to do a Demonstration" beginning on page 6 of the Resource Guide*.

An **EXPERIMENT** is a test that you design to find out an answer to a specific question for which you think you know the answer. Experiments include variables, controls, and multiple trials to test your hypothesis. The Scientific Experiment Method includes: Question, Hypothesis, Procedure, Results, Conclusion.

> For more complete information regarding Experiments, please refer to "How to do an Experiment" beginning on page 9 of the Resource Guide*.

TO BE JUDGED, OR NOT TO BE JUDGED

In the Science Exhibition, students put their projects on display without the pressure of speaking to someone about their project and being judged on the merits of their work.

The Science Fair allows students to speak with a judge, a science professional within our community, about their project. Judges range from teachers to engineers to doctors. These interviews generally last 10-15 minutes, and allow the judge to ask questions about the project and get more insight into the project than a display can show.

**The Resource Guide is available on-line at the Webster Elementary website, under PTA → Science Fair & Exhibition.*

If you have any questions, please contact a member of the Science Fair team at: websterpta@gmail.com

PROJECT DISPLAY GUIDELINES

The Display Board may not exceed 24" in width. Standard tri-fold display boards are recommended, come in many sizes, and can be purchased at any office supply store. The *center panel* determines the display width. There are no restrictions on height.

The display may contain a model or prop, which is limited in size to 18" x 12". The model must fit in front of the display board. If your child's project model is larger than 18" x 12", please take photos of it and place the photos on the display board. Do not bring a large project—we simply don't have the room for it. We encourage your child to be creative, but to keep the space limitations in mind when building the display model.

Electronic devices such as laptops and tablets may be used as your display model. It is not recommended that these devices be left on display for the duration of the Science Fair & Exhibition, as Webster Elementary does not accept liability for items brought to school that are lost, stolen, or damaged.

NO FOOD OR LIQUIDS ARE PERMITTED IN THE DISPLAY MODEL. If your child wishes to illustrate an experiment or demonstration that involves food or liquids, have the child sketch, diagram, or photograph it instead. Our space is crowded and spills are hazardous.

GLASS (INCLUDING LIGHT BULBS) IS NOT PERMITTED IN THE DISPLAY MODEL. Glass is not allowed due to safety guidelines.

ANIMALS (INCLUDING INSECTS) ARE NOT PERMITTED IN THE DISPLAY MODEL.

DISPLAY MODELS MAY NOT CONTAIN ANY FORBIDDEN ARTICLES AS OUTLINED IN THE STUDENT HANDBOOK. This includes items such as tobacco, matches, lighters, caps, knives, laser pointers or other items of like nature. Students may never bring explosives, weapons, weapon look-alikes, or toy weapons of any kind to school.

If you have any question regarding the Project Display Guidelines, please contact a member of the Science Fair team at: webstertpta@gmail.com

INVESTIGATION

May be entered in non-judged Science Exhibition ONLY

WHAT IS AN INVESTIGATION?

An Investigation is thinking of a scientific question and then answering it by doing research. The question is your title.

HOW DO I DO AN INVESTIGATION?

Use the following steps of the Scientific Investigation Method in the order shown. Read all of the steps first for the overall idea of what is expected.

A. Introduction

Think about what area of science interests you. What specifically would you like to ask and answer in that area? Research general information: historical, factual and anything else that might help you understand the subject of your question. This will help you focus and will help your audience understand the context of your question.

To write up the "Introduction" section, you will have two parts:

1. Introduction: Briefly describe what made you think of this particular question.

2. Background Information: Write a general overview of your subject. You can include any relevant facts about your subject that go along with its history. Keep this clear, concise and to the point. Pictures, drawing or diagrams can be included.

B. Research Procedure

An Investigation requires research. This is where you collect data to find the answer to your question. Research can include, but is not limited to: books, the internet, taking photographs, visiting museums, watching videos or talking to relevant professionals in the field. Use whatever resources and methods you need to answer your scientific question.

To write up the "Research Procedure" section, you will have two parts:

1. Procedure: What is the answer to your question? Reference your research to support your answer. Someone who did not participate in your investigation should be able to read through your data and find the same answer you discovered.

2. Bibliography: Make a list of the resources you used to research your experiment. This list should include such things as books, magazines, people and websites. Use bibliography format.

C. Conclusion

Reflect on your process.

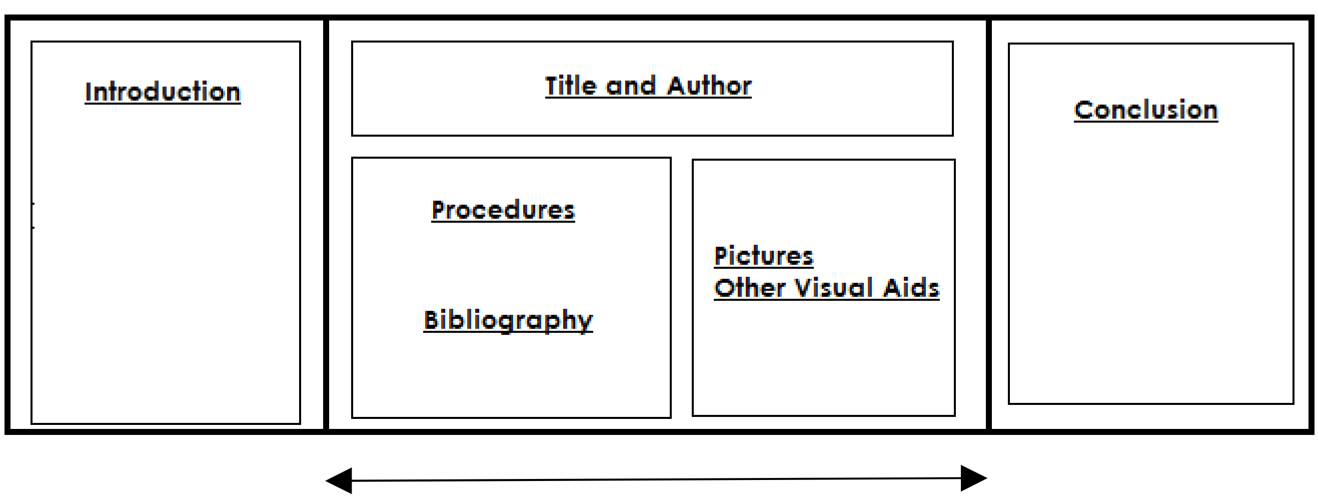
To write up the "Conclusion" section, consider these questions: What is the most important thing you learned during your investigation? Is there anything you would have done differently? Is this leading you toward another topic?

I'M DONE! NOW WHAT DO I DO?

1. Reread the Guidelines on page 3.
2. Complete all of the instructions above.
3. You must have sections labeled with each step of the Scientific Investigation Method: Introduction, Research Procedure, and Conclusion. Don't forget your bibliography!
4. Arrange your display board with your written materials, labels, photos, drawings, or diagrams you might have. Show what you have learned!
5. Consider signing up for an informal judging session with one of our Science Fair judges.

SUGGESTED LAYOUT FOR AN INVESTIGATION

Models or props are permitted, but must fit in an 18" by 12" space.
No animals, liquids, food, or glass are permitted.



DEMONSTRATION

May be entered in judged Science Fair OR non-judged Exhibition

WHAT IS A DEMONSTRATION?

A demonstration illustrates a scientific principle. Some sort of model or apparatus is used to show how the scientific principle works.

HOW DO I DO A DEMONSTRATION?

Use the following steps of the Scientific Demonstration Method in the order shown. Read all of the steps first for the overall idea of what is expected.

A. Introduction

Think about what area of science interests you. What specifically would you like to show in that area? Do some research to find out if a model or apparatus can be done reasonably (ask your parents!) For example, if demonstrating how a computer works, then be prepared to discuss the logical basis of computer programs. In addition, you should be able to discuss the electrical circuitry involved in making the computer work properly.

To write up the “Introduction” section, you must explain the scientific principle you will demonstrate. You can do this by using text, illustrations, maps, charts, lists, etc.

Other information can also include:
Examples of how that scientific principle is used in the real world.
What is known about the scientific principle, including historical background.
Why you chose this particular demonstration to illustrate the principle.
Anything you learned while researching which directly applies to your project.

B. Procedure

Once you have decided which scientific principle you are going to demonstrate, decide how you are going to demonstrate it. Decide how it will be constructed or assembled. Make sure to test it to see if it works properly and that it really does demonstrate your principle.

When your model or apparatus is working optimally, it’s time to actually do your demonstration. Set it all up and conduct your demonstration. Observe and write down anything and everything that happens, including things that happen that you were not expecting to happen. You will use these observations in the Results section. You may document your observations using diagrams, photos, sketches, etc. Remember, no liquids, glass, food, or animals are allowed. Repeat your procedures several times to demonstrate that you can get consistent results with your model or procedures. This will demonstrate that your results might not be due to chance. Record the results of your attempts, and include a summary of them in the Results section below.

To write up the “Procedure” section, you will have two parts:

1. List of Materials: Make a list of everything you used to do your demonstration.

2. Procedures: Write a step-by-step explanation, in clear and logical order, of how you did your demonstration. Write it in such a way that someone who did not actually do your demonstration can understand how you did it. You must include a list of the variables you observed.

C. Results

These are the observations you wrote down during your demonstration.

To write up the “Results” section, organize your results into charts, graphs or lists if possible. If you have done multiple trials of your demonstration, you might want to calculate the averages of any data you have gathered. Results that you cannot easily organize into charts or graphs can be written as statements. You can also use photographs, drawings or diagrams. This section should be logically presented so that someone who did not do your demonstration can understand what happened when you did it. Remember that for Results, write only what happened, not why you think it happened. (That will be part of the Conclusion section.)

D. Conclusion

This section summarizes your whole project.

To write up the “Conclusion” section, you will have two parts:

1. Conclusion: Answer these questions … How did your model or apparatus demonstrate your scientific principle? Why does your demonstration work the way it does? Under what circumstances would it not work?

2. Bibliography: Make a list of the resources that you used to research your demonstration. This list should include such things as books, magazines, people and websites. Use bibliography format.

I'M DONE! NOW WHAT DO I DO?

1. Reread the Guidelines on page 3.

2. Complete all of the steps listed above.

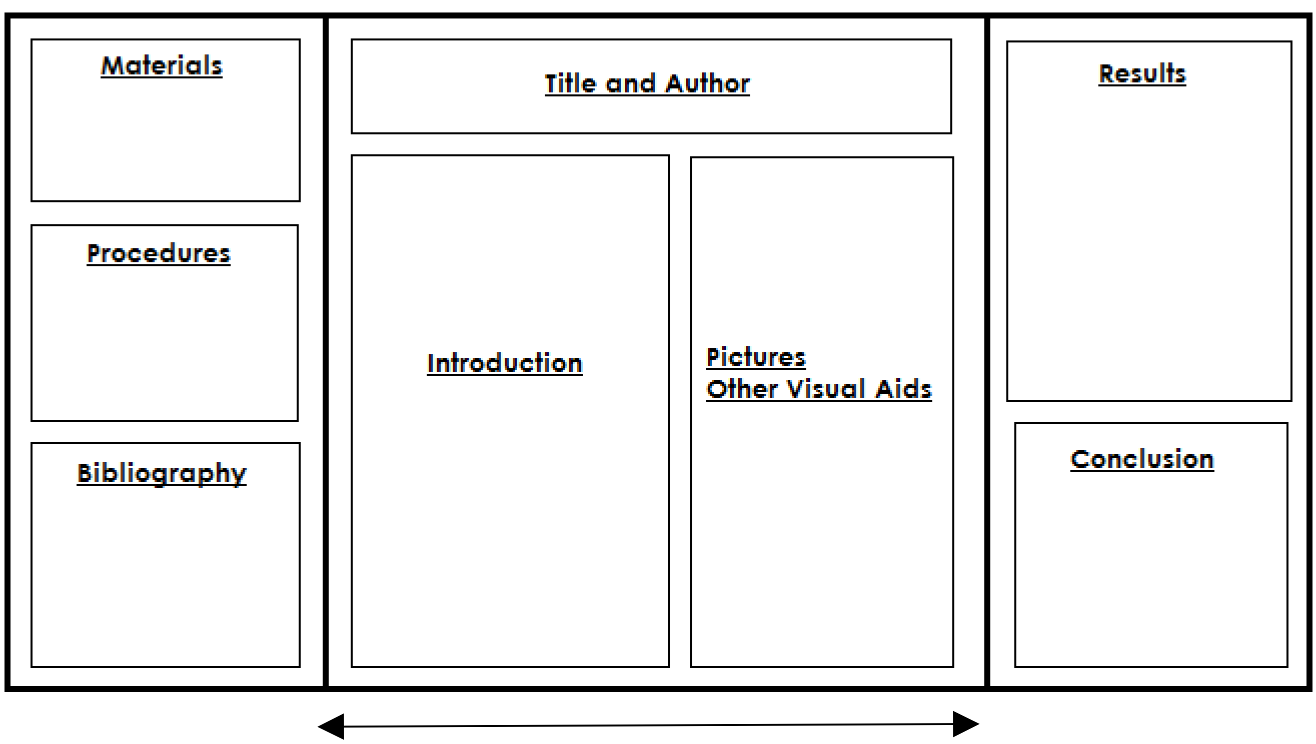
3. Make sure you have sections labeled with each step of the Scientific Demonstration Method: Introduction, Procedure, Results, Conclusion. Don't forget your bibliography!

4. Arrange your display board with your written materials, labels, photos, drawings or diagrams you might have. Show what you have learned!

5. If you are participating in the judged Science Fair, practice presenting your project to someone. If you are participating in the non-judged Science Exhibition, consider signing up for an informal judging session with one of our Science Fair judges.

SUGGESTED LAYOUT FOR A DEMONSTRATION

Models or props are permitted, but must fit in an 18" by 12" space.
No animals, liquids, food, or glass are permitted.



EXPERIMENT

May be entered in judged Science Fair OR non-judged Exhibition

WHAT IS AN EXPERIMENT?

An Experiment is a test that you design to find out an answer to a specific question.

HOW DO I DO AN EXPERIMENT?

Use the following steps for the Scientific Experiment Method in the order shown. Read all of the steps first for an overall idea of what is expected.

A. Question or Problem Description

Think about what area of science interests you. What specifically would you like to do in that area? Do some research to find out if the question you want to ask and answer can be done reasonably (ask your parents!). For example, “Does salt affect the boiling point of water?” You would need to be prepared to discuss the chemical basis of the event. In addition, you should compare the chemical behavior of salt with at least one other non-salt item like sugar or flour.

To write up the Problem Description section, explain how you decided on the subject that you have chosen. Then, in a sentence or two, write the question you want to ask about your chosen subject. You can add more information if you want, but include at least this much.

B. Hypothesis

Your project must have a hypothesis. A hypothesis is an IF … THEN … statement. It is a prediction or an educated guess of what you think the result will be to your question. For example, “If I add salt to water, then the boiling point of the water will be higher.” Your hypothesis might or might not be supported by your results, and the quality of your project is independent of the level of support your hypothesis gets from your experiment.

C. Procedure

Design an experiment(s) that tests your hypothesis. Plan your experiment(s) so that it tests the question you have asked – and no other question. To do this, you will need to control all of the parts of your experiment that are changeable. These are called variables. You will also need a proper control(s). Variables and controls are the most important parts of your experiment.

It’s time to set up your experiment(s) and do it. Observe and write down anything and everything that happens, including things that happen that you were not expecting to happen. These are the observations you use in the “Results” section. If things do not go as planned, do not think you have failed and cannot turn it in. Scientists often get different results than they hypothesized. It is not failure! You still learned something, so share it with us.

To write up the “Procedures” section, you will have two parts:

1. List of Materials: Make a list of everything you used to do your experiment.

2. Procedures: Write a step-by-step explanation, in clear and logical order, of how you did your experiment. Write it with enough detail that someone who did not actually do your experiment can understand how you did it, and could repeat the experiment themselves. Describe the variables and controls used.

   A Word about Variables & Controls

   Lots of factors can affect the results of your experiment. These factors are called *variables*. When you do an experiment, you are testing the effect of one particular variable. We will call that the “test” variable. Scientists call it the “independent” variable. In order to see what the variable will do, you have to keep everything else constant, controlled, and unchanged. The *control* shows that normal, unchanged condition.

   For each variable and control, you should have multiple trials. That means you should repeat the experiment multiple times for each variable and control. Summarize the results. This will make your experiment more accurate. Also, if a problem develops with one of your test subjects or the control, you will have back-ups and be able to continue your experiment. Do your experiment as many times as is reasonable, depending on the complexity of your project. Scientists always use multiple samples and controls, and they do the same experiment many times to make sure that their results are accurate and reproducible.

D. Results

These are the observations you wrote down during your experiment.

To write up the “Results” section, organize your results into charts, graphs or lists if you can. If you have done multiple trials of your experiment, you might want to calculate the averages of any data you have gathered. Results that you cannot easily organize in charts or graphs can be written as statements. You can also use photographs, drawings or diagrams. If they don’t fit on the poster, you may display a journal or separate data sheets. Remember, for the Results section, write only what happened, not why you think it happened (that will be part of the Conclusion section).

E. Conclusion

Look at the results of your experiment to draw a conclusion and ask these questions: Was your hypothesis supported by your data? Why or why not? Keep in mind, science is not always about getting the answer. It is about asking and exploring the question. So if your hypothesis was not supported by your results, you still have a successful project. This happens to scientists all the time.

Continue to think critically about your results. Is there additional research you can do to explain your results? Do it.

To write up the "Conclusion" section, you will have two parts:

1. Conclusion: Start by stating whether or not your hypothesis was supported by your data. What part of your results caused you to decide this? Why do you think your experiment turned out the way it did? How did the variables affect the outcome of your experiment? Write about what future experiments you could do, based on what you learned here, even if it is in a whole new area of study.

2. Bibliography: Make a list of the resources that you used to research your experiment. This list could include such things as books, magazines, people and websites. Use bibliography format.

Science Simon says,

"All scientists run into difficulties. Problems are not failures!

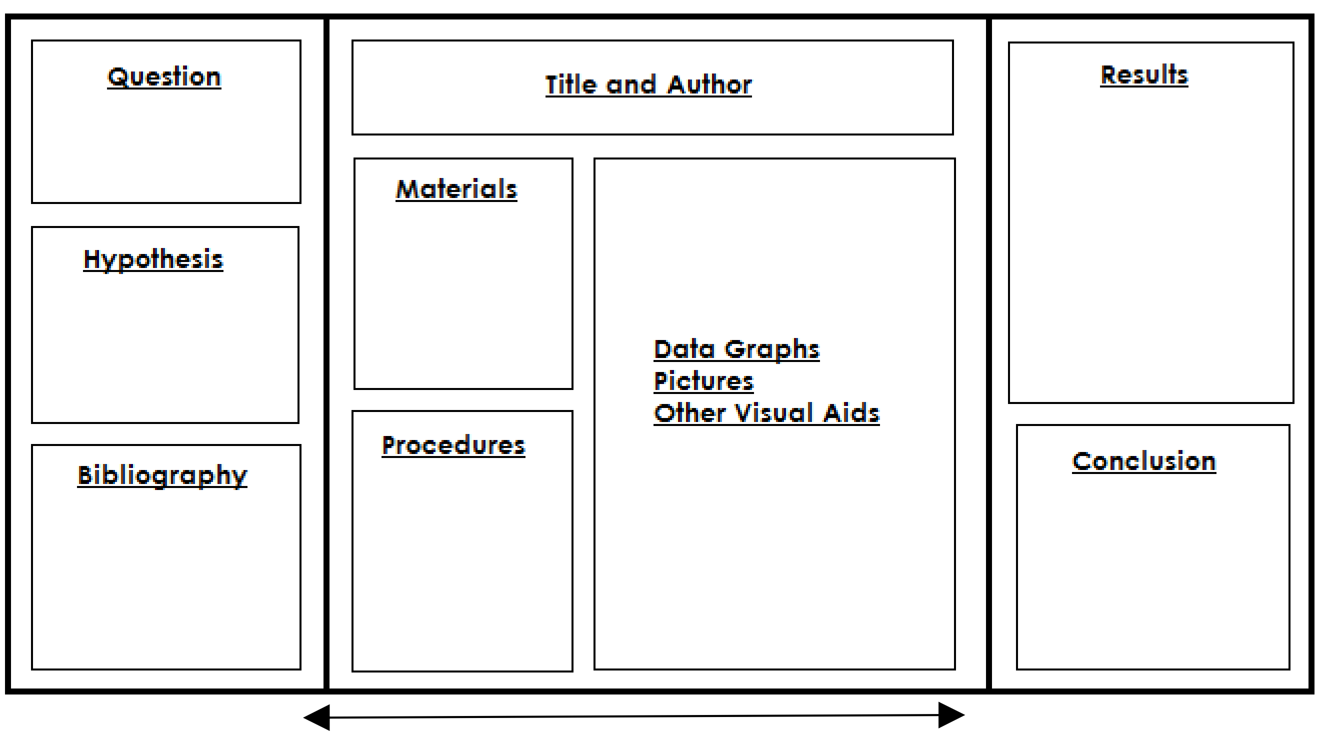
If things don't go well, don't think you can't turn in your project. You still learned something, so share it with us!"

I'M DONE! NOW WHAT DO I DO?

1. Re-read the Guidelines on page 3.
2. Complete all of the instructions above.
3. Your project board must have sections labeled with each step of the Scientific Experiment Method: Question (or Problem Description), Hypothesis, Procedure, Results, and Conclusion. Don't forget your bibliography!
4. Arrange your display board with your written material, labels, and any photos, drawings, or diagrams you might have. Show what you have learned!
5. If you are participating in the judged Science Fair, practice presenting your project to someone. If you are participating in the non-judged Science Exhibition, consider signing up for an informal judging session with one of our Science Fair judges.

SUGGESTED LAYOUT FOR AN EXPERIMENT

Models or props are permitted, but must fit in an 18" by 12" space.
No animals, liquids, food, or glass are permitted.



IDEAS AND RESOURCES

Ideas for projects can come from all sorts of places. They can come from your imagination, books, a kit, other people, the internet, etc. Ideas are all around you! Here are some from previous years that might help you get started:

Demonstrations: show how things work: volcanoes, prisms, telescope, electric generator, basic computer, pulleys, bicycle gears

Experiments: crystal formations, quicksand, what melts ice best, best soil to use for gardening, magnets …

Biology – something related to humans, plants or animals …
Chemistry – temperature, pressure, heat of reactions, solutions, synthesis …
Physics – light, sound, simple machines …

Investigations: solar system, the way a piano works, water samples, bats, seasons, lightning, polar bears, water flow in different hemispheres …

Please keep in mind that for the judged Science Fair competition, any source is equally acceptable for project ideas because the purpose is to understand why your project works the way it does. It is expected that you understand this regardless of where you got the idea for your project, even if you use a kit.

To answer the how's and why's of your project, you will need to do some research. A great place to start is the public library, of course. You may also use other methods such as asking someone knowledgeable in the field, or using the internet. Our Webster LMC will have a bunch of available books as well.

Don't forget the bibliography! Remember to keep track of all of the resources you use for research. You will need to list them very specifically on your bibliography sheet. For instance, if you used books, list each book with title and author. If you visited a museum, write the name and location of the museum. If you spoke to a person knowledgeable in the field, write who it was and why they are important. Having a bibliography is important to acknowledge where your research came from. Your bibliography should be posted on your display board.

If you would like more ideas, or information about how to do a display, the internet has a myriad of resources. Type "Science Fair Projects" on your favorite search engine--you'll be amazed! There are science projects for all ages and interest levels. Here are a few sites:

http://www.sciencebuddies.org/science-fair-projects/project_ideas.shtml
http://www.sciencefair-projects.org/
http://www.freesciencefairproject.com/
http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml
(about the Scientific Method)

POINTS TO REMEMBER FROM PREVIOUS YEARS' JUDGES

Our judges were very excited to be here and enjoyed listening to the students' experiences. They were glad to have had the opportunity to be involved. We asked them to share with us any areas that our students could work on for future projects.

- Ideas do not have to be original. Ideas from family, friends, kits, and the internet are great; however they still need additional research. Challenge yourself a bit more by asking how your idea applies to real life and try to problem solve it. Perhaps you've covered that application but need to spend time on understanding the science behind the idea.
- Consider a kit that focuses on a flower cross-section: You've assembled the flower and know all the necessary parts that the kit points out. Understanding the science behind the idea means that you've researched sites/books/experts about flowers. You understand pollination and can explain it. Now challenge yourself: try to extend beyond the kit and learn about the concept of biodiversity … learn what is attracted to the flower … there is so much to explore.
- Projects take time to do. Spending just a couple of days will not produce high quality results. It is easy for judges to identify last-minute projects that were rushed and completed at the last minute. Do you need to start in October? NO. However, it is obvious to the judges which students started in January or February, and which students started late in March or April.
- There is something to be said for preparation. It is easy to see which student memorized what was coached to them and which student rehearsed what they needed to say. The latter student owns their information. They've researched in different sources, taken that info, put it into their own words/experiences and practiced how to communicate that information to someone else.
- Experiments are much more difficult to do, and in recent years the judges have recognized that with how they've awarded ribbons. The demonstrations that have received Grand Prize ribbons have been projects that have gone above and beyond building a simple model.
- More notes about experiments: A) Some projects were labeled experiments but were really demonstrations, and B) Experiments must have multiple trials (judges love to see graphs/charts) and C) Be mindful of controls and variables.
- Follow the guidelines regarding the scientific method and how to set up the display board. The judges made comments like, "This is a great idea, but he didn't have enough data," or "Why doesn't she have a bibliography?"
- In the "Conclusion" section, you should say, "My hypothesis was [not) supported," as opposed to "correct" or "wrong." We sometimes hear disappointed students afraid to talk about their projects because they feel they've failed. Again, it is not failure! You simply found something that didn't work out this time, but perhaps under different circumstances, it will. ☺