Developing a Science Fair Project

There are really two ways to decide upon a science fair project. Both are useful.

The first is to go through science books and look for science principles and experiments you can do to demonstrate those principles. As you do this, you can find the application of the principles in your life.

Example: In the spring of 2009 I worked with a student who picked an experiment on the latent heat of evaporation. She had the experiment well under way when she discovered that the principle is very important in understanding how a steambath carries heat. She later saw how clouds can carry heat from one part of the planet to another.

This type of project is usually successful, as the young person is following an experiment already tested and designed. It is hard to fail. If done well, this type of project will win honors in most science fairs.

However this type of project doesn't always carry student interest, as it didn't originate in the students' personal life. This type of project might have local applications, but the idea starts in a book written far from the student's frame of reference.

Develping a Collection, Experiment or Observation

COLLECTION

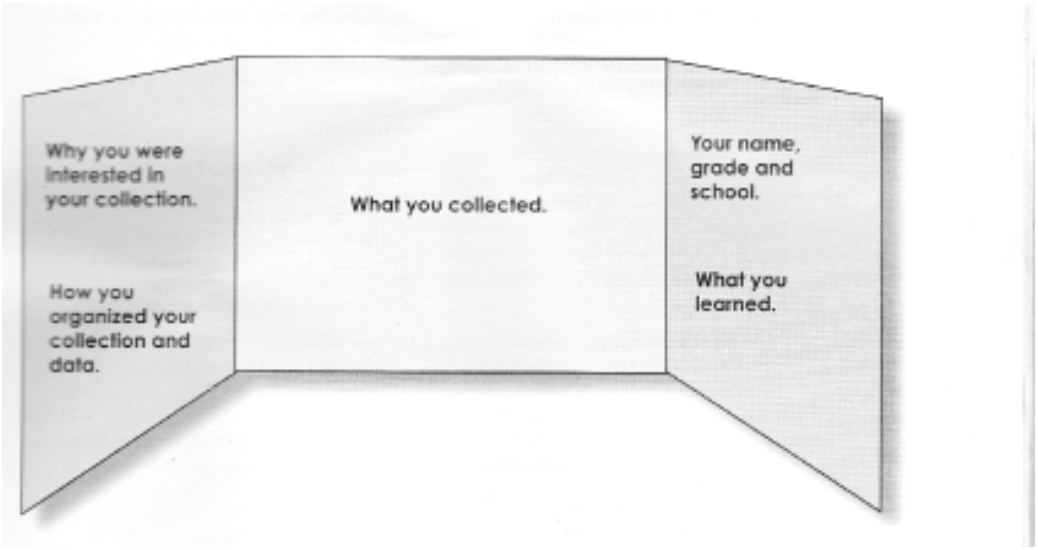
Procedure for a collection The student should find something of high interest to collect. Often lower grades do a collection as a class. While it is a plus to have students collect something of biological importance like leaves or insects, the most important part of a collection is to have the students learn to record where and when the item was collected, how it is similar or different from the other items, and how to classify the collection. Students are learning to visually discriminate, measure weight or dimensions, and learn how to preserve the samples. If they can't be kept long without spoiling, take pictures. How do the items look under a magnifying glass?

In villages, collections of cartridges from every caliber of gun in the community, teeth from every subsistence animal, bones from all local fish, pressed leaves from every subsistence plant, samples from every rock on the beach, or types of driftwood on the beaches are all great possibilities.

The student should organize the collection in a way that it makes sense. Can you add to the collection without disorganizing it? Is there something else to collect from another place? How can this collection grow?

How will the student store it in his/her home? How will you display the collection? Will it interest other people in that collection, or inspire them to make a collection of their own?

As an entry to a science fair, the collection poster might look something like the one below.



EXPERIMENT

There is one type of experiment that should be banned, that is, boring ones. Experiments should be exciting!

Step one, pick a topic you are interested in.

Step two, ask a question about that project. What are you trying to find out? Make sure the experiment is do-able. An experiment is nothing more than a fair test.

Guess. Make a guess what you think is right. This is your hypothesis. Do you think a monofilament net will catch more fish than a green net? Do you think green berries have more pectin than blue ones? Do you think wood splits better in cold or hot weather?

Plan. Plan a fair test to see whether your guess is right.

Find out all the variables, that is, the things that influence the experiment. Hold all of them constant, and adjust one of them. It's that simple.

Example: If you want to test the salinity of the ocean water in a local bay, first find get samples of fresh water, water from far out in the ocean, and water in the bay. Put the electrodes of an ohm meter in the water. The salt water should conduct electricity well, and the fresh water should not conduct electricity at all. Test the local bay water and see how well it conducts electricity.

What are the variables? The distance between the electrodes, the amount of current in the ohm meter, the amount of salt in the water and perhaps the temperature of the water. It would be good to use identical containers with identical amounts of water in each.

Perhaps you are trying to see which type of skin gives the best sound for drumming. What are the variables? Types of skin, thickness of skin, size of drum frame, how hard the drum is struck, kind of striker and tension of the drum frame. It is difficult but possible to hold these variables constant.

How will you tell what is "best?" This is difficult. To do this we have had three elder judges seated with their backs to the drummer. The drummer struck the different drums and the elders judged which drum sounded "best" to them. This is subjective, but uses local experts as the measuring devise.

A student might not be able to experiment with salmon going upstream, but the student can experiment with different methods of observing them. Old timers used to clean the bark off several poles lash them together and put them crosswise in a creek. When fish swam over the whitened poles, the fish that were otherwise invisible against the dark bottom became very visible in contrast to the light colored poles. A student might experiment with alternative ways of observing the fish. (Mom's bedsheet works well, but mom often doesn't appreciate the sacrifice.)

Repeat and record. No experiment is conclusive with only one test. There are so many things that can go right or wrong in one test. Some students want to do a test three times, but even that has much room for error. It might seem boring, but science fair judges like to see tests done five to ten times, with an explanation for numbers that are way off. Field notes are often messy and dirty, but the final presentation should be clean and neat.

List. Make a materials list. What materials were used in the experiment. If someone wanted to test your results, they could use the same materials. If you are using salmon eggs for fish bait that were cured with borax, and someone uses salmon eggs cured by some other means, your results could be challenged. A good materials list keeps the record straight.

Conclude. Does your experiment prove or disprove your hypothesis? Many science fair winners come from a failed hypothesis. What does the data say? What did you learn? If you were to do the experiment again, what would you do different? What new questions have arisen? What are the local applications of your findings?

There are many suggestions for experiments in this book.

The poster format below works well for experiment posters, although the challenge is to catch people's eye and impress the judges with the clarity of the presentation. Be creative!

OBSERVATION

Many situations, particularly with living things or weather, are difficult to experiment with. These situations lend themselves to careful observation.

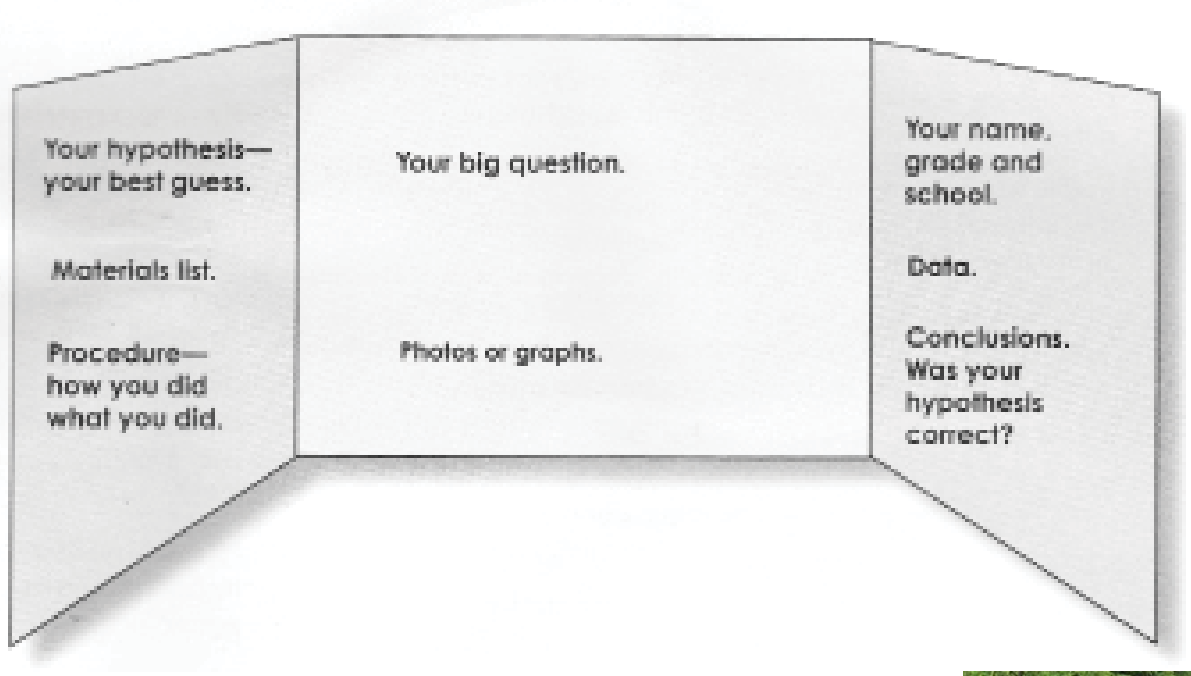
An observation over ten years might give the relationship of temperature, rainfall, the time of the last and first frost and other variables that contribute to the blueberry harvest in a given area. Many people wonder what makes a good berry year. We don't control the variables, but we can observe how they interact with careful observation over many years.

It is not possible for a student to do a science project over ten years. Therefore COSEE recognizes a project as adequate that is done in one year, that, if it were done over a long period of time, would give insight into a scientific conclusion.

Is there a connection between the height of fireweed and the depth of the snow the following winter?

My son-in-law observed that his snowmachine would backfire considerably after the weather turned from cold to warm and back to cold again. He couldn't figure it out, and couldn't experiment because he didn't control the weather.

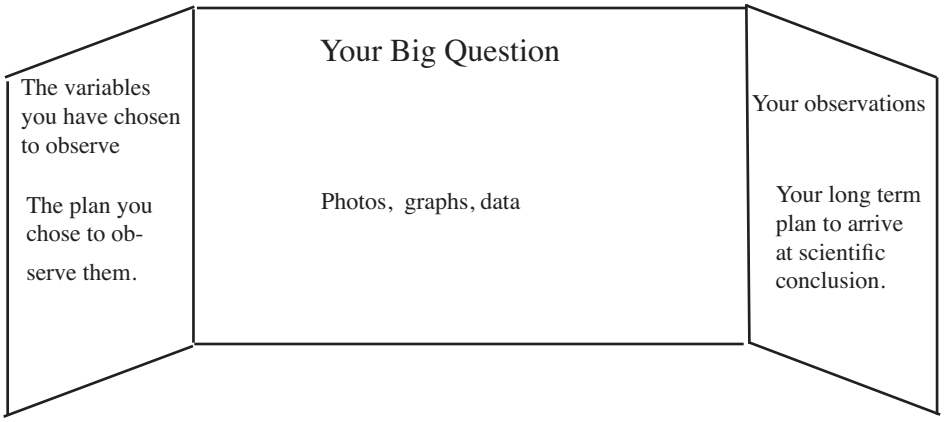
After much thought and observation he realized that when weather turned from warm to cold, his tank developed frost, and the frost caused the backfiring. He learned to keep his tank full during warm weather to keep warmer moist air out of the tank. From there he had no backfiring problems.



We might do an experiment regarding chickadees and what kind of food they prefer. However, we can only *observe* what locations they choose to hide and store the food they take. A good set of binoculars and lots of patience will solve that question.

A COSEE observation project should be set up in one year as if it were to be conducted for five to ten years. There should be great attention to detail. From where were the observations made? When were they made? During consistent times of day? What details were noted?
“There’s more ducks this year than last year,” is not a good observation. What date did the first ones come? What types of ducks? What was the weather and wind direction when they came? When did the migration taper off? How were the numbers of ducks determined? Were they flying high or low? How many hit the local pots?

Your poster might be organized like the one here.



Finding and Developing a Science Fair Project

Get ideas for a project.

Go to your local sources (Local experts, elders, and instructors.)

Decide which kind of project you will do (collection, experiment, observation.)

Then:

Collection

Find a collection that is interesting.

Find out details about your collection from local elders and experts.

Start your collection. Record where and when you got the samples.

Organize your collection. Why did you organize this way?

Look closely at your samples. How are they alike and different?

Decide how to present your collection, including an attractive poster.

Experiment

Pick an experiment that is interesting and do-able.

Ask a clear question about your topic. Go to local elders and experts for advise.

Make a good guess what the answer to your question is. This is your hypothesis.

Plan a fair test to see if your hypothesis is correct.

Do the test several times. Record the results. This is your data.

Make a materials list that shows what you used to do the experiment.

Come to a conclusion. Was your hypothesis correct or not?

Plan your presentation including an attractive poster.

Observation

Choose a topic you are interested in.

Find out as much as you can about your project. Go to local elders and experts.

Be sure the project is safe and culturally appropriate.

Set up the observation. Determine what you will observe, when and how. Check with local and professional experts to see if you have missed anything.

Carefully do the observation over the period of time you planned.

Record your observations.

Decide how you would continue this observation in future years.

Make an attractive poster and display.