The school year has hardly begun, it seems, when it's once again time for...the science fair project. Many parents approach science fair time with a great deal of uncertainty. You want to help your child with the project but you don't want to actually do the project for your child! How can you deal with this dilemma?

This booklet answers some of the most commonly asked questions about science fairs. Here, you'll discover how to help your child:

- select a topic,
- collect materials, and
- create a display.

You'll also discover how a science fair experience helps your child. To start your child thinking about a science fair project we've included dozens of possible science fair questions throughout this guide. Remember: The best project is one that really interests your child— not you!

Does changing the contents (toys, plants, etc.) of a fish tank change the fish's swimming pattern?

Does the size or breed of a dog affect its heart rate?

What container will keep a drink cold for the longest period of time?

Why do schools assign science fair projects?

Your child can benefit in many ways from doing a science fair project— and not just in terms of improved science knowledge and skills. Science fair projects teach problem-solving skills, enhance written and oral communication skills, make your child an expert on a topic which interests him, and provide the satisfaction of accomplishment that comes with the completion of a worthwhile project.

How much should I help?

Of course you want your child's project to succeed. However, as a parent, your best role is to guide and assist— *not* to do the project for your child.

More than anyone else, you know your child's strengths, weaknesses, and level of understanding. Don't be afraid to challenge, but be prepared to offer help if needed. Think of it as teaching a child to ride a bike. She may need your help getting started, or after a fall. But it's just as important to let go and let her ride on her own when she's able.

WHOSE PROJECT IS IT, ANYWAY?

It's still your child's project, even if you've helped plan and guide it. As you make suggestions and coach your child, remember that the main purpose of doing a science fair project is for your child to explore and learn.

ARE WE HAVING FUN YET?— Science fair projects involve wondering, observing, inventing— activities children love to do!

Which kind of adhesive bandage stays on the longest?

Do some kinds of rubber balls bounce better than others?

Which dishwashing liquid is the best degreaser?

Does double-bagging make paper or plastic bags twice as strong?

What materials are best for soundproofing?

Which colors absorb the sun's heat the most? the least?

One of the best ways to help your child is to know the project guidelines set up by the teacher. Find out the date of the science fair, any due dates for interim assignments, safety rules, specifications for the display, and the grading or judging criteria. When you have all of this information, sit down with your child and help make up a project timetable. Allow for unexpected delays by suggesting "due dates" to aim for in advance of the school's.

It's OK to *suggest* possible topics and approaches, but let your child make the final decision. You can check on your child's progress by reviewing preliminary ideas and outlines or helping to find material at the library. See if your child wants help with constructing the display. Play the role of a science fair judge to help your child prepare answers to questions about her project. *And always offer encouragement and praise.*

WHEN IN DOUBT, CHECK IT OUT— Your child can become knowledgeable about a science fair topic with just a trip or two to the local library.

How do you pick a topic?

Here's a good rule of thumb: If your child is interested in the topic, he'll be motivated to do a good job on the project and will benefit most. Encourage your child to think about his favorite things to read, watch, or do (see list at left for ideas). Are there science questions in any of these areas of interest? Urge your child to look in science books in your community library for possible ideas. Other sources of information include science publications (such as *WonderScience*), government agencies, and private businesses. And don't forget your child's teacher. He or she may be the biggest source of help in doing the project.

SCIENCE TOPICS ARE ALL AROUND US

When looking for ideas, your child should consider his surroundings: home, school, and community. Are there any special natural resources in your area? Are there any ideas for topics at museums, hospitals, airports, zoos, parks, local clubs, science centers, universities, or associations?

Once my child picks a topic, what's next?

Which kinds of fabrics are best for keeping you warm?

Which kinds of cereal get soggy the fastest and stay crunchy the longest?

Design a city where all the children can walk to school without crossing streets.

Which kinds of vinegar make the best reaction (loudest, longest, most bubbly) with baking soda?

The next step is for your child to think of a specific **question** about the topic that the project will try to answer. The question chosen will depend on the type of project she wants to do. Many science fairs require projects to be either **exploratory** or **experimental.** Some schools may allow a third type: **invention or design projects.**

In an **exploratory** project, your child might collect or observe certain objects or events in nature and try to draw a conclusion from her observations.

For example:

Topic: Stars and Planets

Question: Why do the stars seem to change their position in the sky during the year?

Your child could observe the stars over a few months and track their apparent movement by comparing them to a fixed point and making star charts and other written observations. By combining observations with research about the rotation of the Earth, your child could form a conclusion about why the stars appear to move during the year.

Another type of project involves setting up an **experiment** to answer a question. Setting up a good experiment begins with asking a very specific question.

"How do we prevent global warming?" would *not* be a good question for a science fair experiment on the environment. The question is not specific enough to design an experiment that can answer it. A better question might be, "How does increasing temperature affect plants that normally grow in cool places?" It would be easier to design an experiment to attempt to answer this question.

MORE EXPERIMENTAL PROJECTS

TOPIC: Music
QUESTION: What is the relationship between the length of a plucked rubber band and the sound it produces?

TOPIC: Animals
QUESTION: Does the amount of food given to a gerbil affect how long it sleeps?

TOPIC: Food
QUESTION: Do different-colored hard candies dissolve at the same rate?

MORE EXPLORATORY PROJECTS

TOPIC: The Earth
QUESTION: Are there different living things in different soils?

TOPIC: Weather
QUESTION: Are temperature and barometric pressure good predictors of rainfall?

TOPIC: Plants
QUESTION: Is there a relationship between the size of a tree and the size of its leaves?

Which kind of sponge is better, natural or synthetic? (and how do you define "better?")

What combination of water, liquid soap and sugar make the best bubble blowing liquid?

Design a soup bowl and spoon that allow you to finish the last bit of soup without tipping the bowl.

How will changing the type of food in a bird feeder affect the types of birds that feed?

TEAM EFFORT— Working as a team can be fun and interesting. See If your child's school allows group science fair projects!

Make sure that your child doesn't pick a question that is specific but is too difficult to answer. Consider the question, "Do larger gills allow fish to swim faster?" This question is specific— but getting fish with different gill sizes and measuring how fast they swim would not be easy. Keep in mind that the question must lend itself to an experiment that can be conducted with available time and resources.

Help your child think ahead, and try to avoid any problems that might arise in designing an experiment to answer the question. Before setting up an experiment, your child should do some research to see what's already known about the question. This research may also help your child decide if the question needs to be narrowed down. Or, it could help him discover a related topic with its own potential questions for a science fair project.

In an **invention** or **design** project, a child devises and demonstrates a new tool or system with which to accomplish a task or process. Like the types of projects mentioned above, invention and design projects still require research, testing, and detailed observations. For example, your child might devise and demonstrate a system for waking someone up without noise, or a new utensil for eating spaghetti. Because not all schools allow invention and design projects, your child should find out what the rules say *before* starting.

Safety first— Make sure your child's project is safe by checking with the teacher before you begin.

Is there a relationship between the length of people's hands and the length of their feet?

Can you train an earthworm to do something?

Which brand of cotton balls is the best (number per price, or rate of absorption, or strength)?

Do larger batteries (D and C cells) last longer than smaller ones with the same voltage (AA and AAA)?

Can male grasshoppers jump farther than female grasshoppers?

Do babies prefer certain colors or shapes of blocks?

Which colors can be seen from the greatest distance?

Do members of the same family tend to have the same favorite color?

TO MEASURE UP, GO METRIC!

Any measurements your child makes in his experiment should be in metric units because scientists have agreed to use this measurement system in scientific experiments.

TO FIND SUPPLIES, BE RESOURCEFUL!

Here are some possible sources of free or inexpensive supplies and equipment. Make sure your child starts lining up supplies early!

- science teachers
- hobby shops
- labs
- hospitals
- suppliers of scientific equipment

What materials are needed?

Good science fair projects should not be expensive. If your child can't find needed materials around the house, he may be able to find them at a local supermarket, pharmacy, or hardware store. Keep in mind that creative projects using basic materials make for the most impressive science fair projects.

How should my child record what happens?

Your child should make detailed observations either with **descriptions** or **measurements**. A descriptive observation could be noting the color of leaves on trees in different seasons. A measurement could be recording how many centimeters tall a plant was at the beginning of an experiment and at the end. All observations should be recorded accurately in tables, charts, drawings, or graphs organized clearly in another way for later reference.

Which kind of soil will hold more water?

What's the smallest portion of a potato needed to start the growth of another potato?

What surfaces do mealworms prefer?

Which paper plates will hold more weight without buckling?

How long can people hold their breath? What characteristics might affect it?

Where do seeds sprout best?

Will a seed grow if part of it has been removed?

What kinds of plants will and will not grow from cuttings?

Does a light object REALLY fall at the same rate as a heavy object?

Does fertilizer affect the amount of algae growth in water?

Do taller people have bigger feet?

Do solutions of different kinds of salt and sugar produce different crystals when they evaporate?

How does too much of a good thing (water, fertilizer, light) affect plants?

Which non-flying insects, if any, will walk across a water barrier?

Can you make a painting using only pigments from the plants, soils, and minerals in your neighborhood?

Is the hatching time of brine shrimp affected by the amount of salt in the brine solution?

Are snails attracted or repelled by light?

How many different living and non-living things are in soil?

NINE TIPS FOR MAKING A GREAT DISPLAY

1
Keep the display simple; include only the essentials.

2
Don't go into lengthy descriptions. Let the headlines tell the story.

3
Be accurate— no misspelled words.

4
Use color to clarify data (graphs, charts, and diagrams).

5
Include photographs or drawings to help show what was done.

6
Protect the display in some way so that it can be handled by others.

7
Make sure that the display will fit into the space available for it at the fair.

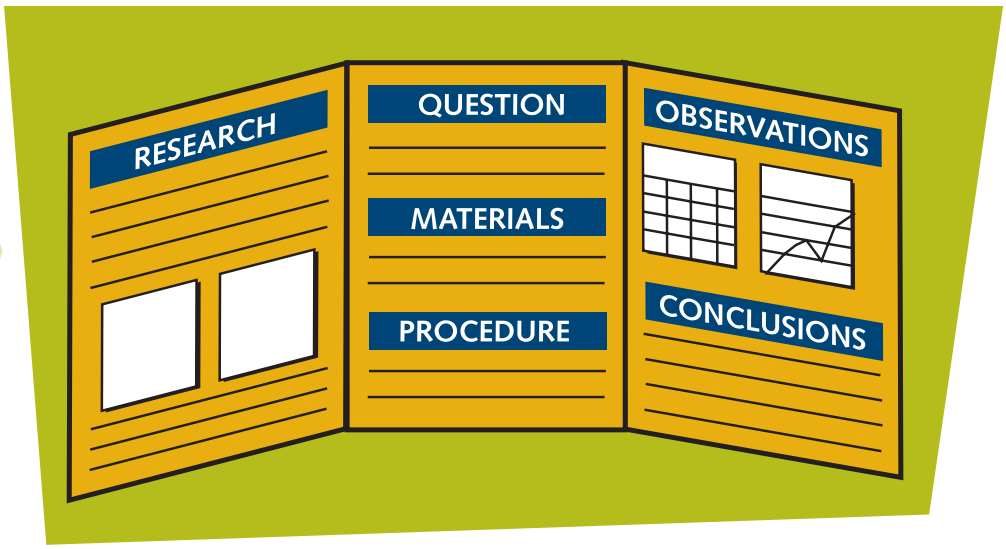
8
Let the teacher or science fair chairperson know early if the display needs electricity or other special arrangements.

9
Use safe, durable materials. If your child is going to display any equipment or items, make sure that they meet the school's safety requirements.

What should the display look like?

Have your child begin by sketching his display on paper. It should feature a large, easy-to-read title and clear subtitles such as Topic, Question, Materials, Procedure, Data, and Conclusions or Explanation.

The display should be as neat as possible. If your child can use a computer to make labels, graphs, and charts, that's fine—but not essential. If he can't use a computer, your child can still make an attractive and effective display. He should use a pencil first and then carefully go over the pencil lines with a dark marker. Letter stencils and a ruler should be used wherever possible.



A TYPICAL SCIENCE FAIR DISPLAY— Generally, the simpler the layout, the better. Try to mark clearly the different sections of your project, and be sure to include the most useful or interesting photos, illustrations, and observations.

What if the results are not as expected?

Don't panic! In the world of science, things don't always turn out as expected. But there's no need to scrap the project. Have your child think carefully about what she did. Was a step forgotten? Can your child repeat the experiment or observations? If she still gets the same results, ask her to explain why her observations didn't fit her expectations. Have her suggest better ways to test her question next time.

Remember, science fair projects are **learning experiences**. If your child learned something, then she was successful. A thorough understanding of a science fair project that didn't turn out as expected is more valuable than a less thorough understanding of one that *did*.

Design a vehicle which can travel 10 feet by itself powered only by rubber bands or balloons.

Are paper grocery bags stronger than plastic grocery bags?

Design a feeding dish or mechanism which will prevent a large dog from stealing food from a little dog.

Which dishwashing liquid produces the most suds?

HAS THE PROJECT BEEN DONE BEFORE?

Originality and creativity are among the qualities judges look for in science fair projects. So it's generally best not to do a project that's been done before— unless your child is really interested in the project and will be discovering something new. Still, it may be possible to make some changes and improvements in the project so it becomes uniquely his own.

What goes into the written report?

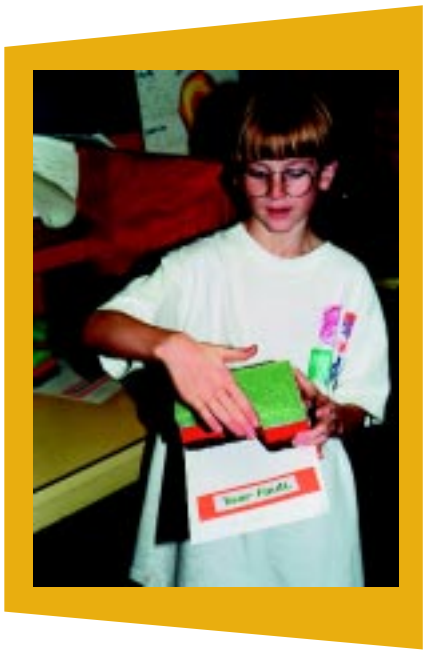
The school or teacher will probably have specifications for the written report. If not, your child should use the following format.

All parts of the science fair project should be explained in detail in a written report. The report should start with a title page containing the project's title, the date, your child's name and grade, and teacher's name. Your child can also include a page of acknowledgments to thank the people who helped with the project. He should follow this with a table of contents and then the report.

THEY WROTE THE BOOK ON THE SUBJECT—A written report helps explain your child's project and what was learned.

The report can start with background information on the topic (from your child's research) and explain why your child chose the topic. Next, the report should state the question that your child set out to answer. A report on an experimental project should list the materials used and describe the experiment in enough detail that readers could reproduce the experiment.

Your child's report should include observations, as well as any charts, tables, or diagrams. The final section of the report should contain the conclusions your child made about the question being investigated. The last page should be a list of any references or sources used. And make sure your child *proofreads* the report!



TELL IT TO THE JUDGE— During the science fair, your child has a chance to explain the project to judges and others.

What happens at the science fair?

HOW PROJECTS ARE JUDGED

Science fair projects are judged according to: originality, use of scientific process and procedure, individual effort, whether they follow the science fair rules, creativity, neatness, and accuracy.

First, a word about competition. Winning is fine, and your child should do the best he or she can to prepare for the science fair. But more than anything else, science fair projects are **learning experiences**. Whenever learning has occurred, we have a winner.

On the day of the science fair, your child will be assigned a spot to set up her display. She'll be expected to stand beside her project to answer any questions the judges or other observers may have.

If your child is shy, you can help in many ways. Remember that **preparation** is the key to a good presentation and to calming one's nerves. You can help your child practice answering questions ahead of time. Also, excitement about the project can go a long way toward reducing nervousness.

Sometime during the fair, make sure that you and your child get a chance to walk around and look at the other students' projects. Your child may see a project that sparks an idea for next year's fair.

GOOD LUCK!— We hope we've given you some useful ideas for helping your child. If your child needs more guidance or assistance, your child's teacher or a librarian are excellent resources. Remember— with preparation and a good plan, doing a science fair project can be a fun and rewarding experience for both your child and you!